XLV

1/-

FLIGHT FILES

and The AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

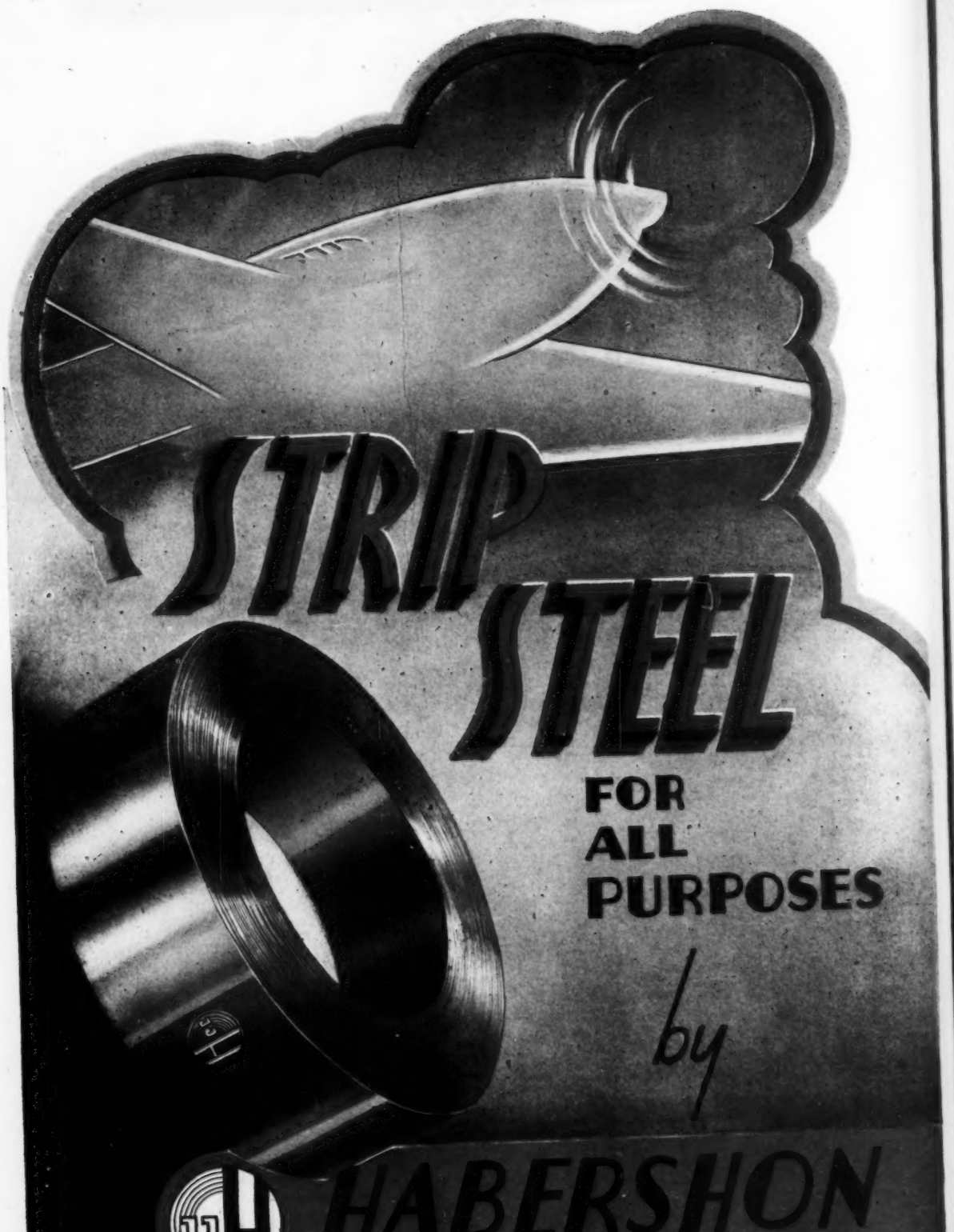
MARCH 2nd, 1944

HUGHES AIRCRAFT CO
ARMAMENT DIVISION

DE HAVILLAND PROPELLERS

In vast production for the Royal Air Force

DE HAVILLAND — *In the attack today — on the trade routes of the future*


STRIP STEEL
FOR ALL PURPOSES
by
HABERSHON
ROTHERHAM

FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

Editor
C. M. POULSEN

Managing Editor
G. GEOFFREY SMITH, M.B.E.

Chief Photographer
JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY:	BIRMINGHAM, 2:	MANCHESTER, 3:	GLASGOW, C.2:
8-10, CORPORATION ST.	GUILDHALL BUILDINGS, NAVIGATION ST.	260, DEANSGATE	26B, RENFIELD ST.
Telegrams: Autocar, Coventry.	*Telegrams:* Autopress, Birmingham.	*Telegrams:* Iliffe, Manchester.	*Telegrams:* Iliffe, Glasgow.
Telephone: Coventry 5210.	*Telephone:* Midland 2971 (5 lines).	*Telephone:* Blackfriars 4412.	*Telephone:* Central 4857.

Registered at the G.P.O. as a Newspaper.

No. 1836. Vol. XLV. March 2nd, 1944. Thursdays, One Shilling.

The Outlook

The Prime Minister on Air Power

EVERYONE must have been struck by the words of the Prime Minister in his latest speech, when he declared that he now gave the primacy to air power instead of placing the war against the U-boat in the forefront, as he had done in all his previous surveys of the war. The war against the U-boat has been defensive, as critically defensive as was the Battle of Britain. In either case success by the enemy would have meant the extinction of Britain's power to resist.

Now it is evident that Mr. Churchill regards the Battle of the Atlantic, to all intents and purposes, as won. He turns to the air war, which is aggressive—"our chief offensive effort up to the present time," as he called it. But Mr. Churchill went farther than that. "The whole of this air offensive constitutes," he said, "the foundation upon which our plans for oversea invasion stand." Those words are rather mysterious, and the Prime Minister did not elaborate them. The bombing offensive is a strategic move, whereas the invasion, once the first soldier has set foot on the Continent, will be an affair of tactics. Mr. Churchill cannot have meant that the invasion would not be attempted until the whole of Germany's war production had been paralysed, even though he said that we intended "to make war production in its widest sense impossible in all German cities, towns and factory centres."

On the other hand, it is likely from earlier official pronouncements, as well as from recent happenings in the Mediterranean, that when the land fighting begins all bombers, heavy and medium alike, will be concentrated on blasting the enemy positions in front of the Allied armies. The rather cryptic words of the Prime Minister quoted above should be borne in mind until their meaning is explained by actions.

Never before has Mr. Churchill spoken so emphatically about the bombing offensive. After one of his conferences in Washington, it will be recalled, he said something to the effect that there was no harm in seeing what bombing could do. There was then evidently a doubt in his mind, but now he has spoken in no dubious tone. He has always been cautious in forming new opinions; and where novel weapons are concerned the cautious man is rightly slow in accepting the claims of enthusiastic advocates. Mr. Churchill is now evidently a convinced convert to the power of the air offensive, and it is known that the decision to press on with it to the utmost was taken so long ago as at the conference with President Roosevelt at Casablanca.

The Draw to the West

THE traditional German policy of *Drang nach Osten* has had to be reversed by the *Luftwaffe* in recent months, and now there is a marked draw towards the West.

The Prime Minister probably surprised most people when he revealed in his speech that the Russian production of aircraft is now about equal to ours, which far exceeds that of the Germans. Though the Russian communiqués seldom mention their air arm, this fact must certainly help to explain the recent series of brilliant Russian successes. Most of these have been won by superior skill in manœuvre, backed by hard fighting. Over and over again the Germans have been taken by surprise, and this is explained when we consider the superiority in the air which the Russians now enjoy. Their Generals can see, while the Germans are almost blind. It may be that in actual battles the Russians rely more on artillery fire than on bombing; but reconnaissance remains the most elementary function of air-

craft, and if correct information is supplied the Generals can set to work with confidence.

It is not only superior Russian production which has been at work; the Germans have felt themselves compelled to accept all the drawbacks of insufficient air support for their armies in order to meet the threat from the West. Four-fifths of the fighter strength of the *Luftwaffe* has been congregated against the British and Americans, and Mr. Churchill believed that a majority of its bombers had also been drawn to the West. Certainly in recent months the number of German bombers in the West has been increased, and this, no doubt, explains the greater weight of attack in the recent raids on London and South-East England. The bomber force assembled to strike at the Anglo-American invasion is available, while waiting for the landing, for raids on Britain. We may expect that when the invasion starts those bombers will find their hands full with other business.

The Double-way Attack

THE closing week of February has seen the bombing offensive doubled in two ways. The American heavy bomber forces under Gen. Spaatz have been striking simultaneously from Britain and Italy, both operating by day. At the same time the attacks on certain targets have been doubled, because while the Americans strike by day, Bomber Command has visited the same objectives by night.

An American air official has calculated that by this time preliminary estimates suggest that German aircraft production has been put out of action to the following extent, namely: 80 per cent. of twin-engined fighters, 60 per cent. of single-engined fighters, 60 per cent. of transport aircraft, and 25 per cent. of bombers. The official gave due credit to German powers of recuperation, and even suggested that a good deal might be made good again in three weeks.

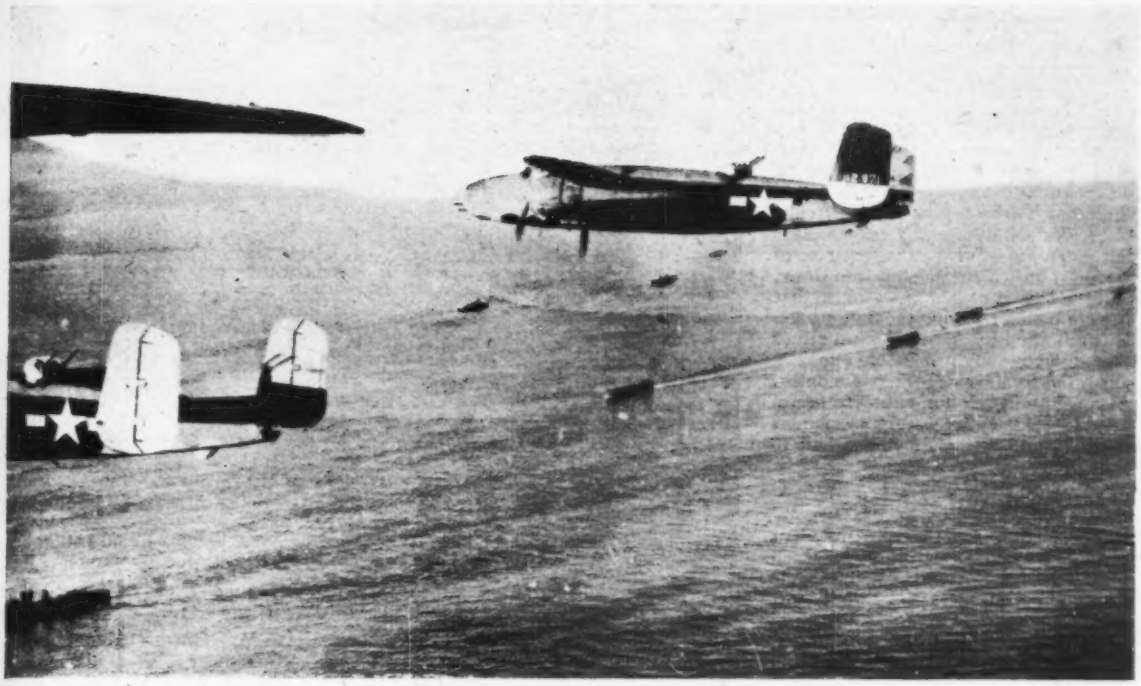
That hardly seems likely, and it is equally unlikely that the Allies will hold their hands and allow the enemy to rebuild without interference.

If the figures are anywhere near accurate, the results ought to be seen in a short time. They should mean a drastic reduction in the losses suffered by Allied bombers in their raids. According to theory, the twin-engined fighters are best for night work, and the reduction of output by 80 per cent. should bring tremendous relief to Bomber Command. The single-engined fighters are best for day work, and a reduction of production by 60 per cent. ought to cut down the losses of the Americans. But of late the Germans have had to send up all the fighters they could muster, so both the Allies should profit from both categories of factories destroyed.

CONTENTS

The Outlook	217
War in the Air	219
The Prime Minister's Review	222
Here and There	224
Synthetic Black-out	226
Safety in the Air	227
Behind the Lines	230
Aircraft in Flying Attitudes	230, *a* and *b*
Comfort, Quiet and Elegance	231
Correspondence	235
Topics of the Day	237
Flying in Piccadilly	238
Service Aviation	239

AERIAL DESTROYER: An Avenger leaves the flight deck of a U.S. Navy aircraft carrier in the Pacific. It has been stated that America now has 85 carriers of all types.



CLOSE SUPPORT: Mitchells with 75 mm. cannon in the nose sweep in low over landing craft full of American marines during the attack on Cape Gloucester, New Britain.

WAR in the AIR

Germany Hit from North and South : New London Blitz Explained

THERE have been many events of air importance in the last week, in addition to the great Russian victory at Krivoi Rog, which followed hard on the capture of Starya Russa. The part played by air power in the Russian victories is seldom mentioned, but it must have been considerable in many ways—not least in reconnaissance. The Germans have now only a small fraction of their fighter strength on the Eastern Front, and probably less than half their bomber strength. As Russian aircraft production is now about equal to British production, which is well ahead of that of the Germans, the Russians must be able to do pretty much what they like in the air. The German forces on that front are armies almost deprived of the help of one major arm, and armies in such a position cannot hope for success.

In the West we have had the Prime Minister's review of the war, which is dealt with at some length on other pages of this issue, the renewal on a minor scale of the German "blitz" on London, and a whole series of major raids by both British and American bombers on various centres of German production.

Outstanding among those raids was the double event staged by Gen. Carl Spaatz on February 22nd, when he used his two bomber forces, the 8th in Great Britain and the 15th in the Mediterranean, to hit Germany from two sides at once. The attacks were all directed against factories which make or assemble aircraft or their parts. The factories making fighters are especially singled out for attack, the Americans obviously arguing that if the fighter strength of the *Luftwaffe* is badly broken, then the Allied bombers will be able to range as they please over the Reich and hit the enemy's production with a minimum of loss. *Flak* would remain a means of defence, but the Americans have lost far more machines from German fighters than they have from ground fire. Machines are sometimes hit by *flak*, but long ago the Americans found that "the higher the fewer."

TAIL-LESS: Some of the damage sustained by a Lancaster which was attacked by an F.W. 190 and an Me 210 during an attack on Brunswick.

The plan of double attacks from north and south has been repeated—as was to be expected.

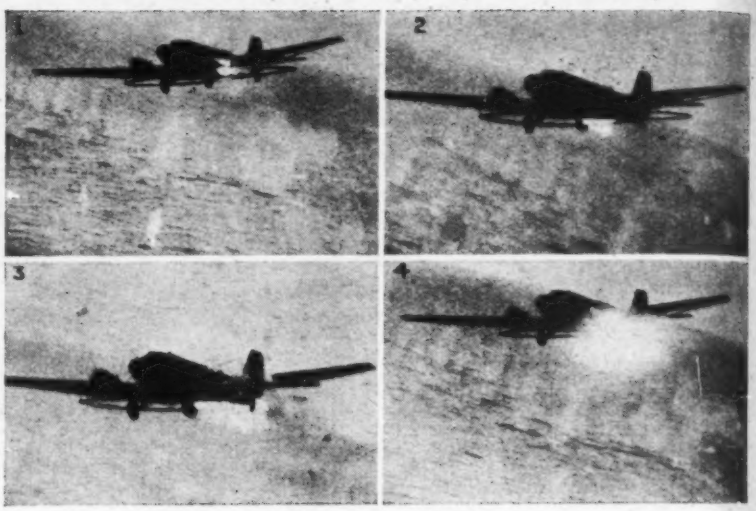
The credit for developing this assault on German fighter factories belongs to the Americans. R.A.F. Bomber Command reached a pitch of power before the U.S. Army 8th Air Force could be built up, and the Ruhr was certainly the area which called for the first attack in strength. From the Ruhr came the great guns and other

WAR IN THE AIR

heavy weapons which were so important to the German armies in Russia. Whether those armies have already suffered from shortage of weapons cannot be said; but probably there has not been time for the results of the Ruhr battle to make themselves felt. There is always a reserve of weapons on which an army can draw, and the output of factories goes to that reserve before reaching the battle zone. It is admitted by Air Force authorities that attacks on production do not affect the battlefields for some months. At any rate it was undoubtedly necessary to cripple the Ruhr as soon as possible, and aircraft factories had to wait their turn.

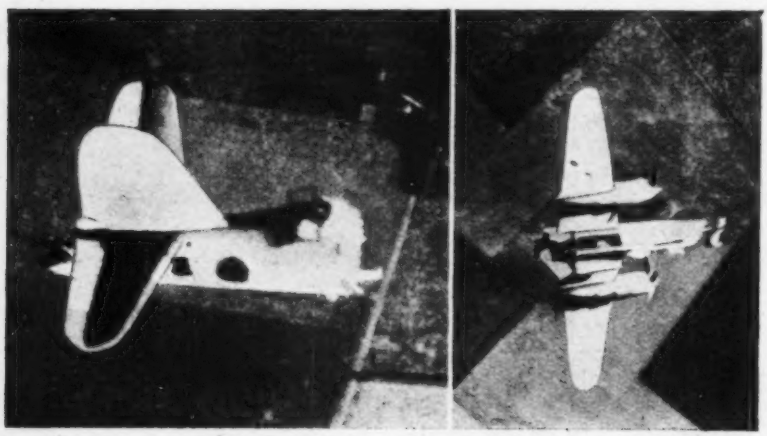
The U.S. Effort

THEN the American Army Air Forces in Europe began to reach formidable sizes, and at the same time the progress of the war made it expedient to single out German fighter factories for attack, delivered with the deadly precision bombing on which the Americans have specialised. There have been many such attacks, but a double assault from north and south was a novelty. On Feb. 22nd the 8th Air Force sent strong forces against the Junkers assembly plant at Bernburg, and other airframe works at Halberstadt and Aschersleben, while the 15th in the Mediterranean sent up heavy bombers against the Messerschmitt 109 factory at Regensburg. These simultaneous attacks would confuse and scatter the defensive fighters. Still, the total American losses were 56 bombers and 11 fighters. They claim that 133 German fighters were shot down, and in the three days of which the 22nd was one, American machines shot down 310 enemy fighters. That must in itself be a nasty loss to the *Luftwaffe*, and to that loss must be added the unknown number of aircraft which it would have received from the factories if they had not been damaged.



SWEPT: A Ju 52 magnetic-mine sweeper as it was shot into the sea off Lorient by two Typhoons of a Southern Rhodesia squadron.

The Germans have not only massed their fighters in the West. The threat of invasion has forced them to bring numbers of bomber squadrons there too. These have been filling in their time with reprisal raids on London and the Home Counties. They have been trying to copy some R.A.F. devices, dropping strips of special paper with metal on one side, to confuse our radiolocation. The R.A.F. has used this device for over a year. The Germans are also groping after Path-finder methods, but have not yet achieved much success with them. No definite plan for their bombing has been discernible, but the aircrews have seemed in a hurry to get their job done and clear off before British night-fighters got on their tracks. The barrage put up by the London guns was terrific.



ONE TO THE ENEMY: Two amazing photographs showing a Marauder falling to earth after having been broken in halves by anti-aircraft fire.

Another Pacific Advance

ADMIRAL NIMITZ is not a man who is given to wasting time. He presses blow on blow. Last week his surprising attack on Truk was recorded. This week he has sent a naval force with carriers still nearer to Nippon, and has bombarded the Marianne or Ladrone group of islands, which includes the American base of Guam. The contingent of the U.S. Pacific Fleet which made the expedition was a strong one, for Admiral Nimitz never makes the mistake of sending a boy to do a man's work. Having got superior strength he applies it, which is one of the main principles of war, whether by sea or land or in the air. The task force on this occasion, as in the attack on Truk, included several hundred carrier-based aircraft. The first two islands attacked were named Saipan and Tinian. The operations are going on, and more news may be published at any moment; but all naval operations call for a period of wireless silence.

When the present Prime Minister was First Lord of the Admiralty, he told the House of Commons that when sailors were fighting they became so intent on the business that they sometimes forgot to report (this was on an occasion when a report would presumably have been legitimate) and that this tendency caused inconvenience to the Admiralty. If their Lordships are thus sometimes left in the dark, men in the street must not complain if they have to wait for news of a victory.

All these Pacific islands are a very long way from Nippon, and, as one American commander has said, in the Pacific the main enemy is not the Japanese but distance. None the less, it is very encouraging to the United Nations to learn of the American

ENEMY AIR LOSSES TO FEB. 26th

	Over G.B.	Con-tinent	Middle East	Italy
Feb. 20 ...	6	0	4	4
" 21 ...	1	0	1	3
" 22 ...	10	2	3	50
" 23 ...	4	1	0	36
" 24 ...	10	0	2	36
" 25 ...	0	3	2	93
" 26 ...	0	4	0	2
	31	10	12	224

Totals : West, 8,028 ; Middle East, over 5,832 ; N.W. Africa and Italy, 4,630.

Navy getting nearer to Nippon, and the news must be proportionately discouraging to the Japanese war lords.

The question now arises: Where is the Japanese battle fleet?

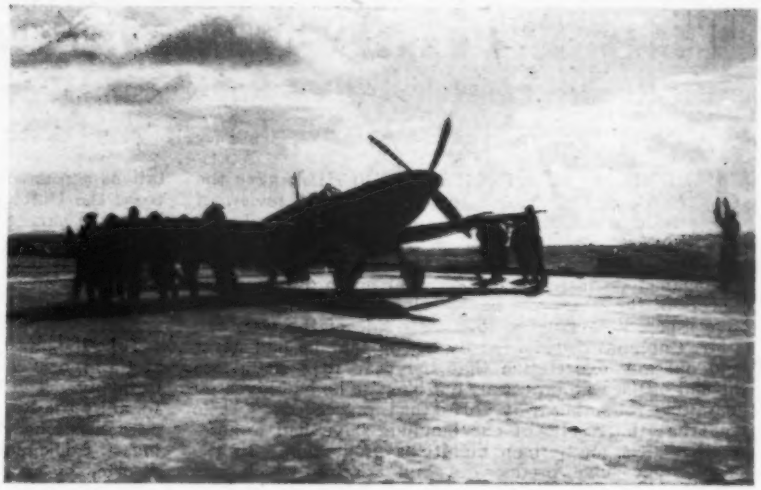
Allied naval and air power in the Bismarck archipelago seems now to be absolute, and the Japanese have in places given up the attempt to dispute it. Attacks by American destroyers and aircraft on Kavieng and Rabaul in New Ireland have recently met with no opposition from the once ubiquitous Zero fighter. Between 50,000 and 60,000 Japanese troops are said to have been isolated in New Ireland and New Britain, and scarcely any supplies can get through to them. Likewise in New Guinea, the Australians have found large numbers of Japanese bodies in a very emaciated state. If the enemy cannot find food for his very hard-living soldiers in the occupied islands, it follows that the shortage of munitions must soon be acute.

BRITISH & U.S. AIR LOSSES TO FEB. 26th

	Over G.B. A'cft.	Continent B'brs.	Continent F'trs.	Middle East A'cft.	Italy A'cft.
Feb.					
20	0	31	3	1	3
21	0	17	8	1	0
22	0	41	15	6	15
23	0	0	1	0	7
24	0	85	11	1	21
25	0	59	4	2	40
28	0	0	0	0	0
	0	233	42	11	86

Totals : West, 10,123 ; Middle East, about 2,376 ; N.W. Africa and Italy, 1,720.

Turning to the naval side of the war in the far north-west, it has been announced that the Germans have evidently given up all intention of repairing the battle-cruiser *Gneisenau*, which is lying in the Polish port of Gdynia in no condition to put to sea. It seems that a bomb dropped by an R.A.F. aircraft did the final damage which convinced the Germans that it would not be worth while to spend more time and trouble on that once-famous vessel. It can also be accredited to the Air Forces of Britain and the United States that Kiel is no longer the main German base. Her place has been taken by Gdynia.



FIGHTER TRIALS : Seafire trials being carried out on the flight deck of H.M.S. *Illustrious*. During flying-off an air flow of 30 knots over the deck is maintained.

Aerial Pincers

THE closing days of February saw a positively startling development of bombing policy in western Europe. Not only did the two American forces of heavy bombers (the 8th in Britain and the 15th in the Mediterranean) work together in closing a sort of aerial pincers on Germany, but there was also the closest co-operation between the day bombing of the Americans and the night bombing of the R.A.F. In a number of cases they worked together on the same targets, and the attack of the one force had hardly died away before the inroad of the other began. On numerous occasions the incoming force found the fires lit by their predecessors still burning, and it then proceeded to liven them up and spread them further afield.

Naturally these tactics exhausted all the elements of the German defences. Fighter pilots cannot carry on by day and night without rest, and the same applies to the civil defence services. Schweinfurt, Leipzig, Augsburg and Regensburg have all been attacked in this way. The attacks have nearly all been directed against factories which make fighter aircraft or parts necessary for them.

At the same time numbers of German fighters have been shot down as they tried to drive the bombers away, and still more were destroyed on the ground near the factories. The Allied losses in bombers have not been light, but none the less their bomber strength is growing, while German fighter strength is certainly diminishing. At the same time German bomber bases have been raided by day by both British and American medium bombers.

GERMAN PRODUCTION GOES UP : The Junkers assembly factory at Bernburg in process of being destroyed. This photograph is typical of what has happened to many of the other German aircraft plants during the recent air offensive.

The Prime Minister's Review

Russia Aided by Allied Raids from West : United Kingdom Casualties in Air War

THE RT. HON. WINSTON CHURCHILL gave the House of Commons a somewhat lengthy review of the war situation on Monday, February 22nd. In the first part of his speech the Prime Minister laid the greatest stress on the Anglo-American bombing offensive against Germany, and then went on to discuss other aspects of the war. We quote below the passages which gave especial prominence to the air side of the war.

Mr. Churchill commenced by saying that he had never held out any expectation that the year 1944 would see the end of the European war, but likewise he had given no guarantee the other way. He then proceeded: "It is true that the results of our bombing have had a noteworthy effect on German munitions production. In the people they have produced a dull apathy, which also affects munitions production and all A.R.P. services. The splendid victories of our Soviet allies on the Eastern front are inflicting immense losses upon the enemy. The fact that so many of the enemy's divisions have been drawn into Italy and into Yugoslavia, while other large bodies of his troops are held in France and the Low Countries by the fear of invasion, has been a help to these victories.

"Moreover, the Anglo-American bombing of Germany, absorbing as it does about 3,000,000 Germans, has drawn, together with other British and American activities, four-fifths of the German fighter force to the British and American front—four-fifths of the fighter force and, I believe, a majority probably even of the bombers are against us and our American allies. This also has been of assistance to the Soviet Union, and I think these statements should be made in justice to the Western allies. They in no way detract from the glory of the Russian arms."

NOTHING in Mr. Churchill's speech to the House of Commons was more significant than the fact that he chose for his background this time not the U-boat menace, which may be assumed to be under control, but the tremendous impact of the Allies' air offensive.

Much speculation has been caused by the Prime Minister's reference to the vast increase in the force of our air attack in the spring and summer." Editorial comments on leader page.

Mr. Churchill remarked that the interests of the alliance might be prejudiced if its other members were left in ignorance of the British share, and also that the Dominions had the right to know that the Mother Country was playing its part. He went on: "For instance, since January 1, 1943, up to the present time—the middle of February—ships of the Royal Navy and aircraft of the Royal Air Force—that is to say, the forces of the Mother Country only—have sunk more than half the U-boats of which we have certain proof in the shape of living prisoners, and they have also destroyed 40 per cent. of the very large number of other U-boats of which either corpses or fragments provide definite evidence of destruction."

Air Casualties

He also gave figures concerning naval successes against enemy shipping, and the losses of the Royal Navy and Merchant Navy in the same period. He then proceeded to say: "Turning to the air, the honour of bombing Berlin has fallen almost entirely to us. Up to the present we have delivered the main attack upon Germany. Excluding Dominion and allied squadrons working with the Royal Air Force, the British islanders have lost 38,300 pilots and air crews killed and 10,400 missing, and over 10,000 aircraft—that is, since the beginning of the war—and they have made nearly 900,000 sorties into the North European theatre.

"The Anglo-American air attack upon Germany must be regarded as our chief offensive effort up to the present time. Till the middle of 1943 we had by far the largest forces in action. As the result of the enormous transportations across the Atlantic which have been made during 1943, the United States bomber force in this island now begins to surpass our own and will soon be substantially greater still, I rejoice to say. The efforts of the two forces fit well together, and, according to all past standards, our effort is in itself prodigious.

Wearing Down Fighters

Take the latest example. During the 48 hours beginning at 3 a.m. on February 20, four great raids were made upon Germany. The first was against Leipzig on the night of 19-20 by the Royal Air Force, when nearly 1,000 machines were dispatched, of which 79 were lost. On Sunday morning a tremendous American raid, nearly 1,000 strong, escorted by an even greater number of fighters, American and British, but mostly American, set out for German towns, including Leipzig, in broad daylight. The losses in this raid were greatly reduced by the fact that the enemy fighters had been scattered beforehand by the British operations of the night before. The fighters descend at bases other than their own and cannot be so readily handled on a second rapidly ensuing occasion, and the full effect of the American precision bombing was therefore realised.

"Following hard upon this, on the night of 20-21, another British raid was delivered, this time on Stuttgart, in very great strength—600 or 700. The effect of the preceding 24 hours' bombing relieved this third raid to a very large extent. Finally, the American force went out on Monday, again in full scale, and drove home in the most effective manner our joint air superiority over the enemy. Taking them together, these four raids, in which over 9,000 tons of bombs were dropped by the two allied and complementary air forces, constitute the most violent attacks which have yet been made on Germany, and they also prove the value of saturation in every aspect of the air war. That aspect will steadily increase as our forces develop and as the American forces come into their full scope and scale.

"The spring and summer will see a vast increase in the force of the attacks directed upon all military targets in Germany and in German-occupied countries. (Cheers.) Long-range bombing from Italy will penetrate effectively the southern parts of Germany. We look for very great restriction and dislocation of the entire German munitions supply, no matter how far the factories have been withdrawn. In addition, the precision of the American daylight attacks produces exceptional results upon particular points, not only in clear daylight, but now, thanks to the development of navigational aids, through cloud.

"The whole of this air offensive constitutes the foundation upon which our plans for oversea invasion stand. Scales and degrees of attack will be reached far beyond the dimensions of anything which has yet been employed or indeed imagined. The idea that we should fetter or further restrict the use of this prime instrument for shortening the war will not be accepted by the Governments of the allies. (Cheers.) The proper course for German civilians and non-combatants is to quit the centres of munition production and take refuge in the countryside. We intend to make war production in its widest sense impossible in all German cities, towns, and factory centres.

"Retaliation by the enemy has so far been modest, but we must expect it to increase. Hitler has great need to exaggerate his counter-attacks in order to placate his for-

merly deluded population, but besides these air attacks there is no doubt that the Germans are preparing on the French shore new means of attack on this country, either by pilotless aircraft or possibly rockets, or both, on a considerable scale. We have long been watching this with the utmost vigilance. We are striking at all evidences of these preparations on occasions when the weather is suitable for such action, and to the maximum extent possible without detracting from the strategic offensive against Germany. An elaborate scheme of bombing priorities, upon which a large band of highly skilled American and British officers are constantly at work in accordance with the directions given by the combined Chiefs of Staff in Washington, has governed our action for some time past, and is continually kept up to date and in relation to our strategic needs and aims. I do not believe that a better machinery could be devised.

"It is always flexible enough to allow us to turn aside for some particularly tempting objective, as, for instance, Sofia, the capital of caitiff Bulgaria. The weather, of course, remains the final factor in the decision where our day or night activities shall be employed. That leaves very great responsibility in the hands of the officers who actually handle these great masses, enormous masses, of aircraft.

"The use of our air power also affects the general war situation by the toll which it takes of the enemy's fighter aircraft both by day and night, but especially by the Americans by day, because they have very great actions with their formations of Flying Fortresses with enemy fighter aircraft. Already we have seen the German air programme concentrated mainly on fighters, thus indicating how much they have been thrown on to the defensive in the air.

"Now this new German fighter strength is being remorsely borne down both in the air and in the factories, which are the objectives of the continuous attack. Every opportunity is and will be sought by us to force the enemy to expend and exhaust his fighter aircraft strength. Our production of aircraft—fighters and bombers—judged by every possible test, already far exceeds the Germans'. The Russian production is about equal to ours. The American production is double or treble the German production.

"When I speak of production I mean not only that of aircraft, not only that of the machines, but of all that vast organisation of training schools and ancillary services which minister to air power, and without whose efficiency air power could not manifest itself. What the experiences of Germany will be when her fighter defence has been almost completely eliminated and aircraft can go all over the country, by day or night, with nothing to fear but the *Flak*—the anti-aircraft—has yet to be seen.

"The same is true of the air power of Japan. That also is now being over-matched and worn down, and the production is incomparably small compared with that of the great Powers whom Japan has assailed. Whereas on former occasions when I have addressed the House and tried to give a general picture of the war in its scale and proportion, its structure and proportion, I have always set the war against the U-boat menace in the forefront. I deliberately, on this occasion, give the primacy to the great developments in air power which have been achieved and are to be expected. This air power was the weapon which both the marauding States selected as their main tool of conquest. This was the sphere in which they were to triumph. This was the method by which the nations were to be subjugated to their rule. I shall not moralise further than to say that there is a strange, stern justice in the long swing of events."

The Prime Minister concluded his speech with an examination of the present situation in various Allied and subjugated nations.

ELECTRICITY IN AIRCRAFT

A PLEA for more extensive use of electricity in the operation of various aircraft services was put forward by Mr. C. G. A. Woodford, of the M.A.P., in an informal discussion at the Institution of Electrical Engineers on February 21st.

It was pointed out that at the beginning of this war British aircraft had one or two 500-watt generators, while German aircraft had two of about the same size but giving 1,500 watts each. We now commonly had three or four of 1,500 watts each, and American aircraft now coming into service had seven generators of 5,000 watts each. In this country 3,000-watt generators were coming into use. These were of 25-30 volts.

A change-over from low-pressure d.c. to medium-pressure a.c. was to be expected. The advantages would be in the direction of saving of weight and space, since higher speeds could be adopted. A high degree of reliability was also to be expected.

MOSQUITO DEVELOPMENT

THE Ministry of Aircraft Production have permitted public release of the fact that the fighter version of the Mosquito in current production can carry a 500lb. bomb under each wing, in addition to 1,000lb. bomb load within the fuselage.

Thus the fighter version with four 30 mm. cannon and four 0.303in. machine guns, now carries twice the bomb load for which the Mosquito bomber (without cannons and guns) was originally designed in 1940. A photograph of the fighter-bomber Mosquito, with a bomb under each wing, headed the "Service Aviation" pages of *Flight*, February 24th.

The story of this development, briefly, is as follows. The conception of the Mosquito as an unarmed bomber with fighter speed was advanced by Sir Geoffrey de Havilland to the Air Ministry in September, 1939, as a twin-Merlin wooden aircraft with two crew, carrying 1,000lb. bomb load at fighter speed, with a range of 1,500 miles, and, after discussion, was accepted on that basis in Christmas week, 1939.

Prototype trials made clear that the all-up weight could be increased and de Havillands put forward the suggestion that by shortening the vanes on the standard 500lb. bomb, four of these could just be accommodated in the fuselage space in place of four 250lb. bombs, thus doubling the destructive load. Meanwhile the fighter version was separately developed to counteract the night blitz. Then two 250lb. bombs and later two 500lb. bombs were mounted behind the cannons. Then long-range drop tanks were mounted beneath the wings. Then racks for two 250lb. bombs were fitted, interchangeable with the drop tanks, and then these were substituted by two 500lb. bombs.

The secret has been kept for a long time, and its release explains the remarkable usefulness of the basic fighter version which, by the quick changeover between bomb racks and extra tanks, is able to serve as a long-range fighter or as a fighting and bombing intruder of range and destructive load accurately adjustable to individual sorties.

SIR STAFFORD CRIPPS AND A.I.D.

THE Minister of Aircraft Production and Lt. Col. H. W. S. Outram addressed a remarkable gathering of over 1,000 A.I.D. staff from all parts of the country at the Kingsway Hall recently.

Sir Stafford Cripps expressed great appreciation of the service of A.I.D., particularly as guardians of the quality of production as distinct from quantity. The Minister stressed the fact that we have relied on quality rather than quantity for our supremacy in the air, which we have achieved through the good work of our industrial managers, technicians, and skilled workmen in the aircraft industry. The Minister commended A.I.D. on firmly insisting that the second best would not do. It could be fairly claimed that the quality of our engines, aircraft and instruments has actually improved, and Sir Stafford added that he hoped the good service A.I.D. were doing for the industry would be realised by contractors and recognised by their wholehearted co-operation.

Lt. Col. Outram, Director-General, in expressing regret for the absence of the Chief Executive, Air Chief Marshal Sir Wilfred Freeman, stated he was proud of the contribution of A.I.D. to the aircraft industry, and expressed determination that the department would make greater contribution still in the future; he was sure he could rely upon the co-operation of his staff.

POLISH "V.C." FOR SPITFIRE PILOT

FOR the first time since the Polish Order of the Virtuti Militari was instituted, the Gold Cross of the Order was recently awarded to an officer of the Polish Air Force. The Order was founded nearly 300 years ago.

Wing Cdr. A. Gabsziewicz, D.S.O., D.F.C., who for the past six months has led a Polish Spitfire wing on offensive operations over France and the Low Countries, received the Gold Cross at a fighter station near London from General K. Sosnkowski, Commander-in-Chief of the Polish Armed Forces. Wing Cdr. Gabsziewicz already held the Virtuti Militari (5th class).

HERE AND THERE

Aide-de-Camp to the King

GRP. CAPT. (ACT. AIR COMDRE.) D. A. BOYLE, A.F.C., has been appointed Air Aide-de-Camp to the King in succession to Air Comdre. (Act. Air Vice-Marshal) B. E. Embry, D.S.O., A.F.C., and Grp. Capt. G. R. Beamish, C.B.E., is appointed Additional Air Aide-de-Camp with the acting rank of Air Commodore.

Reinstated

MEMBERS of the aircraft industry will be interested to learn that on February 21st Mr. H. G. Bloss resumed his post at the Ministry of Aircraft Production as Deputy-Director of Airframe Production in charge of Fighter Aircraft Production.

Where Royce is Buried

A GIFT of £300 has been made by Mr. A. F. Sidgreaves on behalf of the directors of Rolls-Royce, Ltd., to the restoration fund of the twelfth-century church of St. Andrew's, Alwalton, Huntingdonshire, where Sir Henry Royce was christened and buried.

Interest in Jets

AT the works of General Aircraft, Ltd., on Tuesday of last week, Mr. Geoffrey Smith was invited to speak to a gathering of several hundred of the employees, during the mid-day meal break, on the subject of gas turbines and jet propulsion and the possibilities in the future for these new developments. He was introduced by the Publicity and Entertainments Manager, Capt. E. I. Short.

Another U.S. Carrier

IN addition to the *Shangri La*, the recent launching of which is recorded on page 234 of this issue, another U.S. aircraft carrier, the *Bennington*, also of the Essex class, was launched last week.

Of 27,000 tons, the *Bennington* is the first ship of its kind to be built entirely in a New York naval yard. When the Essex class is completed it will comprise 13 ships, each carrying over 80 aircraft. Armament includes 16 5in. guns, the speed is 35 knots and the complement over 2,000.

Fliers Barred

THE only place where the latest U.S. award—the Bronze Star—cannot be won is in an aircraft.

Taking precedence over the Air Medal and the Order of the Purple Heart, the new Bronze Star is for "heroic or meritorious achievement or service *not* involving participation in aerial flight," and it can be won in action against the enemy by anyone in the U.S. Army, Navy, Marine Corps or Coast Guard.

THE QUEEN showed particular interest in the model section of a civil aircraft cabin when she recently visited the Colour in Everyday Life Exhibition at the Royal Academy. This charming picture shows Her Majesty with Mr. J. A. Milne, O.B.E., president of the British Colour Council.

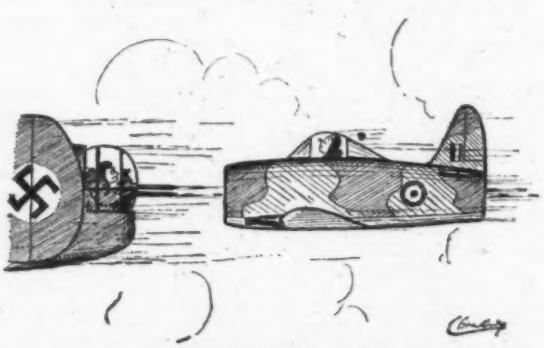
Moscow Honours Harris

AIR MARSHAL SIR ARTHUR HARRIS, chief of Bomber Command, was one of the four senior British officers recently awarded the Order of Suvorov, First Class, by the Russian Government. The others were General Alexander, Admiral Sir John Tovey, and Admiral Sir Bruce Frazer.

Back from Canada

CAPT. HAROLD BALFOUR, Under-Secretary for Air, returned to Britain by air from Canada last week, where consultations have been taking place about the Commonwealth Joint Air Training Plan.

Air Marshal Sir Peter Drummond and Air Ministry officials accompanied Capt. Balfour to Ottawa, where they had discussions with Mr. C. G. Power, the Canadian Air Minister.



A story without words!

Care of Oil Drums

THE present shortage of wooden barrels and steel drums, recently emphasised by the Ministry of Fuel and Power, makes the proper care of such containers essential. To assist in this, Sternol, Ltd., have prepared an instruction card, which will be sent to anyone who cares to apply, dealing with this important matter.

"Bradshaw" of Air Travel

A PRE-VIEW of post-war aerial travel is provided by an exhibition at the Museum of Modern Art in New York, where Pan American Airways are displaying a tentative time-table for future world-girdling flights, complete with ticket prices.

While it is emphasised that both the times and prices are subject to change, the figures give some idea of the speed and cheapness with which it should soon be possible to fly abroad.

Flying over the Polar route, it will take 19 hours 12 minutes to reach Moscow from New York, and the cost of the journey there and back is put at £65. The flying time between New York and London is given as 13 hours 48 minutes, and the return fare £46.

Radio in Aviation

A BRITISH Commonwealth and Empire conference has just been held in London to study the application of wartime developments in radio to post-war civil aviation. Sir Stafford Cripps was the chairman.

Technical problems were discussed so that a useful contribution may be made to talks with the United Nations and, later, to wider international discussions. Meantime, delegates to the

HERE AND THERE

Commonwealth conferences are to report their recommendations to their respective Governments.

Technical Hitch ?

THOUGH the trouble may have been "ironed out" by the time these words appear in print, there is at the moment of writing a delay in the resumption of the Sweden-British air service for what are (perhaps euphemistically described as "technical difficulties."

Reuter quotes air circles in Stockholm as saying, "The cancellation is not surprising, as both Britain and Germany reserved the right to withdraw the guarantee for individual flights if military conditions demanded."

Bigger and "Beautifuller"

IT must have been a slight misprint, but in the February 15th issue of a British propaganda review, *Mundo Grafico*, published in Lisbon, an article on British aircraft referred to a bomber capable of carrying "bombs of 4,000 tons."

We could, from known values, estimate for your entertainment the probable wing-span, length, weight and fuel consumption of such an aircraft, but, as a well-known radio character is wont to remark, "What's the use!"

Faster U.S. Production

REFERRING to the growth of the U.S.A.A.F. in the European theatre, Mr. Charles E. Wilson, executive vice-chairman of the War Production Board, recently gave some figures to illustrate the enormously increased rate of aircraft production in America.

"The early fighter type required 157,000 man-hours," he said, "but mass production cut the time to 7,800 man-hours by the time the 1,000th plane had left the assembly line. A four-engined bomber once took 200,000 man-hours, but this was reduced to 13,000 for the 2,000th plane."

SHAPE OF WINGS TO COME ? Publicised some time ago as a twin-hull flying-boat, the latest "gen" on the proposed Kaiser-Hughes giant, in the form of the above drawing, shows it to have changed into quite a conventionally shaped aircraft with eight radial engines. Three of these HK-1 flying boats are projected, but only one is to be built "for the time being."

Diamond Research

INVESTIGATIONS into the properties of diamonds with special reference to their application and preparations for use in present and potential industry, is being undertaken by a new research department established by the Diamond Trading Co., Ltd., Holborn Viaduct, London.

The department is under the management of Mr. Paul Grodzinski (a contributor to our sister journal, *Aircaft Production*, on the subject of cutting tools) and its extensive technical library is at the disposal of all users of diamond tools

Disparity in Pay

POINTING out that the ordinary wages of civilian workers at airfields are often as high as that of a bomber captain, and higher than that of other pilots, gunners, and those of lower rank "who are constantly risking their lives fighting," Mr. R. Purbrick (Conservative M.P. for Walton) has asked the Secretary of State for Air to "take steps to remedy the disparity."

One wonders why Mr. Purbrick has picked on this particular facet of the whole question of relative pay and personal risk. War workers in their thousands receive much higher payment than the infantryman, the tank driver, the gunner, the sailor and other members of the Fighting Forces whose equipment they make. And does he suggest levelling up, or down?

The "Popular" Angle

"A LARGE proportion of Britain's air fleets are made of sea water." That staggering statement is the beginning of an article which appeared not long ago in a popular Sunday newspaper under the equally breathless heading, "Airplanes from Sea Water."

Actually, the article, which was interesting enough without such silly exaggeration, dealt with the production of magnesia (from which magnesium is made) at Ministry of Supply plants set up on the coast for this purpose when the war cut off most of our overseas supplies. Actually, the amount of magnesium used in British aircraft is not very great.

Sea water contains magnesium chloride, and the addition of lime, or dolomite, causes magnesia to be precipitated in the form of a creamy white powder by an electrolytic process.

So now what about an article headed "Aircraft Grown on Trees"—since quite a lot of wood and rubber is used.

n

LIGHTENING THE LIGHTNING: Several man-hours in production and some 20lb. in weight are being saved by omitting camouflage paint from P-38 fighters, which are now to appear like aerial knights in shining armour—except for the dark areas, as shown, painted to prevent the pilot being dazzled. More speed and altitude are expected from reduced skin-friction and weight.

Synthetic Black-out

Novel and Simple Aid for Instrument-flying Training

A PARTICULARLY ingenious adjunct to blind-flying training has been developed in America by the Polaroid Corporation in conjunction with the Navy Bureau of Aeronautics.

It is dependent on the fact that the superimposition of the three primary colours blue, red and yellow will cut out the whole of the visible spectrum. In this case the same effect has been achieved by using one of the primary colours—red, and one of the secondary colours—green, which is, of course, a mixture of the other two primaries—yellow and blue. The cutting is not absolute but is sufficient for the purpose. The method employed is to fit green plastic material to all the cockpit windows and making the pupil wear red goggles. The instruments are lighted in the same manner as they would be at night. When this has been done the instructor sees everything to the horizon as in daylight but, of course, coloured green. The pupil can see nothing at all outside the cockpit, but, since they are on the inside and lighted independently of daylight, the instruments appear clearly illuminated by a red glow.

The main drawback to this system is that it presupposes totally enclosed trainer aircraft, but it does obviate the use of a hood and the many opportunities to cheat through the cracks.

(Left) The cockpit, pupil and view as they appear to the instructor. (Above) The red and green filter overlapped to show the degree of opacity.

THE NEW EXACTOR REMOTE CONTROL

THE new "Type SL" hydraulic remote control manufactured by the "Exactor" Control Co., Ltd., is a clean and compact design incorporating a transmitter unit and a receiver unit. The control medium, as in previous "Exactor" types, is oil, and the transmitter unit incorporates a relatively large-capacity reservoir, sufficient to maintain the correct amount of fluid in the work circuit over lengthy periods.

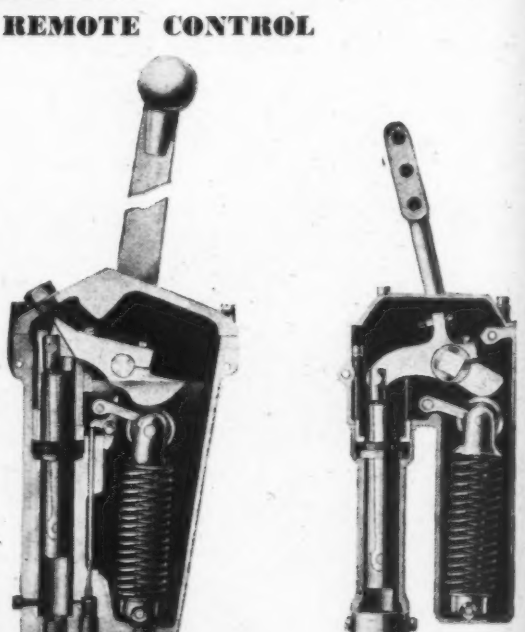
As the circuit is a closed one and the fluid virtually incompressible, the action is "dead-beat," there being no back-lash in the transmission; it is claimed that positive control to $\pm\frac{1}{2}$ deg. is possible.

The interior mechanism of both units is basically similar, although the transmitter incorporates a synchronising device to enable both units to be "re-phased" should any discrepancy arise in the working circuit. The operating lever can be fitted on either side of the transmitter unit, and is keyed on to an extension of the rocker shaft.

Movement of the lever controls the stroke of a glanded piston, which displaces oil in the single pipe line between the units to provide comparable movement of the receiver unit piston. The piston rocker arms each bear against a roller follower carried on a strong spring, both springs being of similar strength, and the rocker arm cam profile in the transmitter unit is such that equal balance of spring exertion is attained throughout the range of control movement.

The limit of power transmission for the return stroke is 100 inch/lb. over distances up to 150ft., this being governed, of course, by the exertion of the receiver unit spring, but on the pressure stroke much higher forces may be exerted.

Synchronising action is provided by an additional 15 deg. travel on the transmitter unit lever, which permits the roller follower to rise behind the heel of the rocker arm cam, and so move a bell-crank which depresses, via a rod, the spring-loaded poppet valve between the work cylinder and the reservoir. Should the work circuit contain less oil than normal, due to leakage, for example, the circuit is immediately re-charged to its correct level. The effect of a loss of oil from the work circuit has, due to the coeval action of the springs, only the effect of shortening the working stroke, but does not in any way affect the positiveness of the transmission.



The transmitter unit is on the left and the receiver unit on the right. The range of travel of both levers is 60 degrees, the relative movement being antipathic and dead positive.

Safety in the Air

Some Thoughts on Post-war Air Transport : A Few Purely Personal Opinions

By H. R. L. SMITH

WHILE we wait with bated breath for the results of the Government's deliberations on air transport, whether we are to have one or more "chosen instruments," what the policy towards the manufacturers is to be, etc. (and nothing very concrete has emerged so far) those of us whose lives are tied up in air transport, and who have a keen realisation of its enormous potentialities for the advancement and emancipation of mankind, are prone to sit and ponder on the Utopian air transport systems which will emerge (we hope!) when common sense—that rare commodity—prevails, and we can sort out our differences around the conference table in a spirit of co-operation, tolerance and mutual trust, without getting overheated, and without wanting to blast each other from the face of the earth.

Personally, I am one of those optimistic, and probably hopelessly idealistic, souls, who refuse to believe that a succession of ghastly wars, each one bloodier than the last, is necessarily inevitable, and who, through the medium of civil aviation, look forward to making a useful contribution to the quelling of any future desire for fisticuffs. Mark you, if we ever return to the status quo of 1939 (which some are so foolish as to call the "good old days") then another war within a generation is a certainty: I am quite convinced that if we are so criminally insane as to give Germany another chance of rearming, she will not lose the third time—she will take good care of that—and it therefore behoves all of us who have the cause of civilisation at heart (and I write in the widest possible cultural, moral and ethical sense of that much-used word) to put forth every ounce of effort to ensure that the coming peace is a lasting and permanent peace, based on solid foundations. And that is where we in civil aviation will play our rôle. It is a great responsibility in the greatest cause of all—the unification of mankind, irrespective of petty nationalities, racial, religious and linguistic differences—when we cease to proclaim, with inordinate and inexplicable pride, that we are English or American, or Spanish or Austrian, and announce, instead, that we are citizens of the world, no longer blinkered by the narrow views of mere nationalism.

"NO SAFETY—no traffic, no traffic—no air lines," is the motif of this interesting contribution from a man with long practical experience of commercial aviation.

The author points out that air transport is, or should be, something more than a mere money-making business. It can be a tremendous power for good in creating better understanding between nations.

A Goodwill Force

Naturally, many factors other than civil aviation will have to be co-ordinated towards this end (the very question of overcoming hatred and re-educating people to *tolerate* each other, let alone like each other, for example, is a tremendous task) but I have no hesitation in stating my belief that civil aviation is destined to be one of the greatest single influences in the future remodelling of the world.

In the course of some sixteen years' wandering about Europe and the Near and Middle East, from Scandinavia to Iraq, and Poland to the Irish Sea, during which I have dwelt among many different peoples, I am now more than ever convinced of the innate decency of the ordinary man and woman, and am absolutely certain that, once the present poisonous political cults are eliminated, and we have at last finally and irrevocably made up our minds to outlaw war as an instrument of determination (which it never is anyway), we can get together with real understanding.

All this might appear to be very much by the way, but in fact it has a very definite bearing on what I have to say, because without this wide international view, and the belief in the Brotherhood of Man, we might just as well pack up air transport and go in for real sordid commerce of the Ikey Mo variety. Air transport is a business, yes, but a business with something more than the mere profit-making motive; it has an ideal, a purpose which cannot be calculated in terms of mere money. And there is a lot more to it even than filling up aircraft with fuel, passengers, mail and freight and getting them from A to B, though to operate them *safely* and with *certainty* from A to B and B to C and so all along the route is the prime essential of successful air line operation. Without safety no transport system can survive. Let us hope that the afore-mentioned problems will be tackled in a really sincere spirit, and that the results come up to the expectations of the most enthusiastic of us.

What are the things to aim for in air transport? I am now looking at the question from the point of view of the people who actually have to do with the day-to-day running of air lines, and who are therefore in the best possible position to know what is wanted. We will assume that such outstanding matters as the internationalisation of airports, and the question of aircraft of one nation flying over the territory of another nation, etc., etc., etc., have been settled. As I have already indicated, the most vital question is that of safety, and there will be very few indeed who will seriously query this stipulation; for unless air travel can rank alongside rail, sea and road travel in this respect, it will never attract the large volume of traffic we all hope for.

Avoiding Accidents

Even in this air-minded age, there are many people who still talk about "keeping one foot on the ground," and a surprisingly large number have yet to take their *baptême de l'air*. Up to 1939 there were far too many unnecessary and altogether avoidable crashes, some due to aircraft failure, some to bad operational organisation, and others to sheer carelessness, or "cockpit trouble" as the Americans so pithily phrase it. All, without exception, attracted the most widespread and unwelcome publicity in the daily Press, always eager for sensation and featuring these unfortunate accidents out of all proportion to their real importance. (We might do worse than include the big dailies in our scheme of education for the tiny tots.)

Things were beginning to show a marked improvement, of that there is no doubt, but it is essential that the most rigid international laws must govern these matters, because a fatal crash affects not only the particular operating company concerned but civil aviation as a whole, and we cannot afford any set-backs.

On the whole, I do not consider that the war has really advanced aviation, despite vociferous claims to the contrary, except in one sphere, and that is the application of radio to the perfection of bad-weather flying and blind-landing devices; these can be just as well applied to the

SAFETY IN THE AIR

safe guidance of air transports as to bombers, and there is no doubt that we are well advanced in this respect, and every encouragement should be given to this most vital side of the question. I am certainly no believer in the theory that converted military aircraft will ever make satisfactory civil machines, because the purpose and application of the two types is as far apart as the poles, but in the sphere of radio development we are on common ground.

Not only is safety incumbent upon the air line operations department but also upon the manufacturers themselves; the closest possible liaison must be maintained between the makers and the operators, and the utmost care exercised in the design and construction of civil transports to ensure that they are safe and easy to fly under all conditions, and that they have no vices. It may appear somewhat unnecessary to stress this point so much, but it is one which I think *must* be drummed in over and over again, because it is *the* most important problem: no safety —no traffic, no traffic—no air lines . . . simple as that. And an air line can have hundreds of pilots and other staff in gorgeous uniforms and gold braid, but they cannot refute *that* argument.

Another important factor in the quest for safety is the zoning of airports and the liquidation (I think that is the word I want) of all objects within a radius of 5 km. of the airport more than 8 metres high. It sounds almost impossible, but with a really vigorous policy it can be done; very good progress was being made at certain Continental airports when I last saw them At one famous *Flughafen*, infamous for the number and height of its surrounding chimneys and church steeples, rendering a bad-weather approach at under 100 metres almost certain suicide, steps were well in hand for their lowering: since then the R.A.F. have had a say in the matter, and the local scenery has undergone a considerable change!

Co-operation Essential

So, the question of safety is not just for one individual or department to solve, but is a team job for several men—the aircraft makers, the air line operators, the airport owners, etc., all of whom can, and must, co-operate. Of necessity, I can only deal very briefly with the matter here, but I have tried to outline the salient points of the problem.

Next in importance to safety I would put regularity and frequency of service; the first being really bracketed with safety, and the second regulated by the actual and potential traffic offering on any particular route.

After these I would put speed and comfort, and lastly choice of types of service. It must be remembered that these are but a few facets of a many-sided problem, and I can but outline them in the scope of this article. I consider that regularity and frequency should be considered before speed: I feel that the travelling public would prefer a comparatively slower service upon which they could rely to a faster schedule which seldom kept to its advertised figures.

Regularity of operation is absolutely essential to the obtaining and retention of first-class traffic, whether passenger, mails or freight. There used to be an old saying "Time to spare, travel by air," and I am afraid this contained more than a germ of truth; it has certainly caused me great embarrassment on more than one occasion when I have been surrounded by hordes of irate and indignant passengers, all of whom simply *had* to be at their destinations in time for urgent business appointments, and who in fact, hadn't the slightest hope of being there within the next twelve hours. Many of them gave up air travel in disgust and returned to the slower, but more certain, methods of surface transport. There are, of course, occasions when such incompleted journeys are unavoidable, but every effort must be made to mitigate the serious inconvenience caused, and on trans-Continental routes there is much to be done by effecting a closer tie-up with the rail and road transport systems. Air line schedules must run with the same precision, both in respect of departure from and arrival at terminal stations, as the "Flying Scotsman" or the "Cheltenham Flyer": if they don't, then the Post Office, passengers and freight consignors will want to know why.

Frequency of service as I have mentioned, will be decided according to potential and actual traffic offering on any particular route. The traffic department of an air line must have the fullest possible information on the commercial possibilities of a route in order to arrive at a suitable frequency of service. Under this heading I would mention "Market Research," which must be organised and conducted on a scientific and up-to-date basis in accordance with the most modern practice in salesmanship. The fullest possible investigation must be made into every reason why the public use, or would use, air services, and the whole idea pursued to the last detail, with officers in charge of departments specialising in the revenue possibilities of specific trades, businesses and professions.

"Every Hour on the Hour"

As an example of high frequency of service, I might mention the London-Paris route, which was operated by Air France "every hour on the hour" throughout the day, and by British Airways and Imperial Airways some half-a-dozen times daily. This schedule was definitely justified, but in my opinion suffered a setback when the railway people put on night sleeper coaches, so that one could travel in great comfort without losing a night's sleep. I believe the last evening aircraft brought one to one's destination somewhere around 1 a.m., not a very convenient hour to start registering at hotels, go to bed and be up betimes for a good day's work.

I personally am inclined to favour the highest practicable frequency on any given route, using aircraft of medium capacity, rather than large machines operating at infrequent intervals. This would apply not only to European lines, but also to Empire and trans-oceanic routes.

Reverting to the subject of market research for a space, this department would have to decide, with the aid of past and present records, details of the following:

Mixed Loads are generally favoured, for the present at least, so as to give the opportunity of using the capacity of each fleet to the full as well as to give a choice of services and rates to the public for all forms of load. I am of the opinion that segregation of loads (particularly fast services for first-class mail only) will eventually occur, but not in the immediate future.

Freight should certainly always be booked, like passenger accommodation, as consignors would prefer to know that they could not send their goods until a certain date but that it would go straight to its destination on the service by which it left, rather than remain in uncertainty as to its date of departure and whether it would be offloaded en route or not, and consequently be unable to work out when it was due to arrive at its destination.

Mail.—I feel also that some form of booking mail should be instituted so that the public could know on what date a letter posted should leave and arrive. This might be achieved by arranging for the Post Offices to reserve—and pay for—a certain capacity on each service, and this is a matter which would doubtless be dealt with by the mail and cargo departments of the various air lines.

The Speed Fetish

Turning now to speed. While fully acknowledging that speed is the *raison d'être* of air transport, I do feel that in the past too much attention has been paid to this feature to the detriment of safety, principally so that one air line could show an alleged advantage over another. Too often advertised schedules have not been maintained, and accidents have been sustained in an effort to keep to them, much to the detriment of the company concerned and civil aviation generally.

Cruising speeds of 300-400 m.p.h. will not be common figures for some time to come, at any rate. In the first place, such speeds would be hopelessly uneconomic, and I think that cruising speeds of around 250 m.p.h. will represent a very fair average for some time to come. After

SAFETY IN THE AIR

all, such a speed over any route shows a time saving that no form of surface transport can possibly compete with, and should be developed economically on that basis. I have not the slightest doubt that, with more efficient aircraft and power units, combined with other developments of which we are only on the threshold at present, commercial speeds will eventually materially increase, but not just at present.

A considerable amount of development should be given to the *lower end* speed scale; aircraft are landing much too fast, and although high landing speeds are quite admissible when you have a large and well-equipped airport to put down on, with a runway of some 2,000-3,000 yards, it is quite another matter if you are obliged to land hurriedly at some small intermediate field, or even on no field at all. This comes back full-circle to the ever-present problem of safety, and I think that the fullest possible investigations should be made into the question of the optimum employment of slots or flaps or any other device which will ensure the lowest possible stalling and landing speeds. And my final remark on this subject is that the danger of fire in a crash must be virtually eliminated; there is no more horrible thought than that of being roasted alive in a burning aircraft, when the elimination of the fire danger might result in nothing worse than a few scratches or bruises.

Types of Service

The last salient point is the choice of types of service which we should offer to the public.

These may be roughly divided as follows:—

(1) "Express" or "Mail Express."
(2) "Main Line" service.
(3) "Tourist" or "Cabin" service, failing a better name.

"Express" or "Mail Express."—Fastest possible service, carrying chiefly surcharged mail, but with accommodation for a few urgent passengers, not necessarily in great comfort, and some urgent freight.

This service would be operated by specially designed high-speed aircraft, not necessarily very large, operated by crews in relays. They would operate at high frequency by day and night, and stop (and exchange loads) at *principal* points only, on-carrying to other cities and towns on the system being conducted by local feeder lines.

(2) *"Main Line."*—Not so fast as "Express" and operated by larger aircraft, carrying all-up mail, passengers in the greatest comfort, and freight. They should operate on a reasonably high frequency, but not necessarily at night. (In this respect, though, night flying for all classes of traffic is inevitable and desirable, and will have to be provided for). The idea of this service is to provide *de luxe* accommodation on the longer Empire or trans-Continental routes. Long hops between principal points would again be the rule, with on-carrying once more performed by local feeder lines, as in (1), but the flying would be limited to between 0900 and 1700 each day. Such an aircraft would cruise at about 250 m.p.h., so should cover about 2,000 miles a day. Passengers would thus be able to have a good breakfast before they started (thus avoiding the unpleasantness of very early rises), in addition to arriving at their nightstop in time for tea (assuming this custom is universally perpetrated), a bath, change, and a full evening's enjoyment of dining in comfort, sightseeing, conducting business, or even a mere lowly pub-crawl! With an "Express" service in addition to this "Main Line," the likelihood of having passengers travelling on a matter of life and death on the latter service, and consequently being upset by a leisurely evening, would not arise. Also, it would not be such a strain as present schedules on the elderly and/or infirm, besides limiting the necessary catering to light, though well served, meals in the air, and thus avoid past unsuccessful endeavours to serve heavier and hot meals. In addition, the latter consideration would reduce the weight of the buffet equipment required.

A Use for Old Aircraft

Although I have indicated that night-flying on such a service will inevitably come, I do feel that at least one kind of service should night-stop as outlined above, and that the class of passenger indicated would be the most likely to pay for it.

(3) The above considerations also lead one to believe that there might well be scope for a third type of passenger (and other load) service which might be termed "Tourist" or "Cabin" for want of a better name. This would be slower than the "Express" or "Main Line" services, and would cater chiefly for freight, although having accommodation for a limited number of passengers and parcel mail. This could well be operated by obsolescent aircraft, thus utilising them to the fullest extent, and would call at more places on any given route—in fact, a sort of bus service. Such a service would operate on day and night schedules, and I am very keen on seeing all services do so wherever practicable, in view of the greater economy obtained by operating machinery for as many hours out of the twenty-four as possible, and because this eliminates an advantage which surface transport would otherwise have over us.

Thus, very briefly and sketchily, have I outlined my views of what we should aim for. There are several points which I have not been able to mention, e.g., landplane or flying boat?, high-wing, low-wing or flying wing?, pressure cabins?, passengers' comments and complaints, catering problems, loading baggage and sorting mail, etc., etc.

DEATH OF WALLACE BARR

WITH the death of Mr. Wallace Barr, as a result of enemy action, British aviation has lost one of its best known and most popular figures. The tragedy is a double one in that Mrs. Wallace Barr lost her life by the same bomb. Their son, who is in the Royal Air Force, was home on leave and was injured, while his married sister escaped with her baby.

A. J. A. Wallace Barr was born in London in 1889. He was a nephew of Lt. Cdr. H. E. Perrin, secretary of the Royal Aero Club, and a frequent visitor to the club throughout his aeronautical career, which began in 1911, when he founded Cellon, Ltd., to manufacture aircraft dopes. The business began in a very small way, with Wallace Barr as managing director, staff and general factotum combined in his person. He it was who introduced to this country aircraft dopes of the cellulose type, which were a great improvement compared with the materials then in use.

From those modest beginnings Wallace Barr built up the great business which made Cellon world famous. Dopes of the cellulose type played an important part in British aviation in the days of fabric covering, but Wallace Barr saw farther afield, and in time his company achieved renown for its paints, varnishes and lacquers, not only in their application to aircraft but to buildings and other things.

Wallace Barr was one of those somewhat rare men (although we have not a few of them in the aircraft industry) whose charm is not dimmed by worldly success. To the very end he retained an almost boyish enthusiasm, and in the days before the war there were few flying meetings or other aviation events at which he was not present.

British aviation is very much the poorer for his passing, and to his son and daughter we extend our sincere sympathy in the loss of their parents.

The funeral was held at Golders Green Crematorium last Saturday. Many members of the aircraft industry attended.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Manna

THE Helsinki correspondent of *Nya Dagligt Allehanda* reports that a large number of Russian paratroops have been dropped in Estonia for purposes of sabotage, particularly against railway communications.

For Defence

FROM neutral sources it is reported that the Germans have started work on two new big airfields in Norway. One of these is at Eggemo, between Adalen and Ranasfjorden, and the other at Haslemo, only some 18 miles from the Swedish border.

Research

AN Institute for Aircraft Armament is to be opened at the Brunswick College of Technology, which is known in Germany for its extensive facilities for aeronautical research.

Col. Dr. Alfred Kuhlenkamp, one of the leading *Luftwaffe* experts on aircraft armament, is to be the director of the new institute.

A German View

MILITAERISCHE CORRESPONDENZ AUS DEUTSCHLAND, the official organ of the German High Command, in a leading article suggesting that the *Luftwaffe* strength is increasing, gives an apology for its past relative inactivity. "If it is the aim of the *Luftwaffe* Command to do all in its power to be strong in 1944, then all instances of weakness last year must be considered completely insignificant."

"It cannot be denied," it says, "that the year 1943 was a year of supreme effort for the *Luftwaffe*. First, the growing strength of the enemy's Air Force took its full effect, and, secondly, the fact that the German fronts in the east and south receded naturally resulted in a certain loss of material. Besides, the increased air raids on Reich territory made it necessary for the air defences of the homeland to be extended, and, above all, fighter and destroyer aircraft were therefore temporarily withdrawn from the fronts.

"There had been no standstill in the production of aircraft, nor was there a standstill, let alone a decrease, in the training of flying personnel."

The article goes on to say that "the *Luftwaffe* has prepared for the possibility of an invasion by distributing its strength and building up a reserve which will not be drawn upon at present."

It is also predicted that "in all probability the *Luftwaffe* will receive in the not too distant future new and improved types of aircraft. The adjustment of production to completely new designs must have naturally resulted in the old production slackening to a certain extent."

Altitude Jump

A NEW device enabling air crews to parachute to safety even at the greatest altitudes was claimed by Dr. Siegfried Ruff, Chief of the German Aeronautical Medical Research Department, quoted by the German News Agency to-day, says *Reuter*.

"Under war conditions high-pressure cabins are no solution for the problems involved in stratosphere flying, as they may be punctured by enemy action, and even oxygen masks are useless at great heights," the report said.

"The new device will enable *Luftwaffe* combat aircraft to be flown at heights up to 50,000ft."

Luftwaffe Bomber

THE He 177, one of the types reported to be employed by the *Luftwaffe* in operations against this country, has been in the news for some time.

It will be recalled that the He 177, described in detail in *Flight*, December 30th, 1943 (Behind the Lines), is Germany's largest bomber which has been previously used, mostly on long-range over-water bomber/reconnaissance duties. It is fitted with two D.B.610 engines, each of which gives 2,700 h.p. at 18,700 feet, and is composed of two coupled D.B.605 12-cylinder inverted vee liquid-cooled engines of the type used on the Me 109G.

The He 177 carries its bomb load internally, and types operating over this country were reported to be armed with 20 mm. cannon in the tail mounting, and a number of smaller calibre (probably 13 mm.) guns in dorsal, lateral and ventral positions. The top speed of the He 177 is about 300 m.p.h.

Markings of Axis Aircraft

A REVIEW of the markings of Axis aircraft in use at present, published in the trade paper *Deutsche Uniformenzeitschrift*, gives the following facts.

For her military aircraft, Hungary recently altered the markings which she had introduced shortly before the outbreak of the present war. The green-white-red triangle (*Winkel*) on the wings and directional control has now been replaced by the cross used by the Axis Powers. The cross is white on a black square, that is, like the German Iron Cross, a *Balkenkreuz*, but with the colours reversed. Just as the German aircraft bear the swastika, Hungary has the national colours, namely, red, white and green, on the directional control and —which is unusual—on the elevator.

The German *Balkenkreuz* shown on the military aircraft of the Reich is the old cross of the Teutonic Order and is the basis for the Iron Cross medal. This cross is now also painted on tanks. Up to January 1st, 1939, the rudders of German aircraft carried the German national flag, the white field containing a swastika on a red background. Since then they have carried a black swastika within a white frame.

On Bulgarian aircraft a diagonal black cross on a white square takes the place of the German *Balkenkreuz*. The diagonal cross in green has been in use on the Bulgarian naval flag for a long time. The rudder may be painted with the national colours, white, green and red, or be completely yellow.

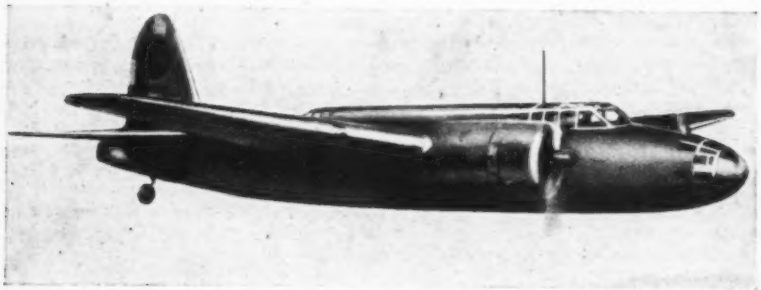
Finnish aircraft have carried the swastika since the declaration of Finnish independence 25 years ago. They bear the Finnish national colours, blue and white.

Latvian aircraft also carry the swastika in the Latvian colours, red and white, arranged diagonally, as in the case of Germany.

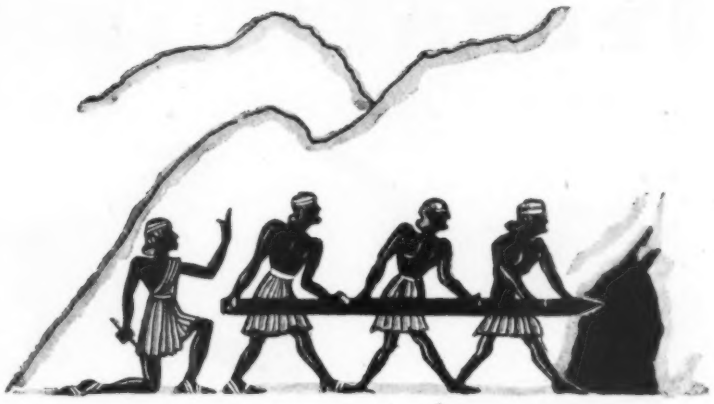
The Croat air force bears on its wings —with the exception of the right upper wing—the insignia of the independent State of Croatia, the 25 white and red squares, and above them the blue "US" of the Ustasi, framed by the red trebly intertwined vine (*Dreigeflechtsranke*). This is also shown on the rudders, but not on the fuselage.

Rumania has designed for her aircraft a combination of the Royal signature with the previously displayed cockade in the national colours. The cross, yellow with a blue frame, formed from King Michael's initials, repeated four times, is surrounded by the cockade, the centre of which is blue, framed by yellow, with red outside. The markings are separated from the basic colour of the aircraft by a white edge. The directional control is marked in the national colours, blue, yellow and red.

Slovak aircraft carry the German *Balkenkreuz* on their fuselage and feature on their wings and rudders an emblem composed of the Slovak national colours, white, blue and red. It is a blue cross with a white edge, its centre being a red circle.



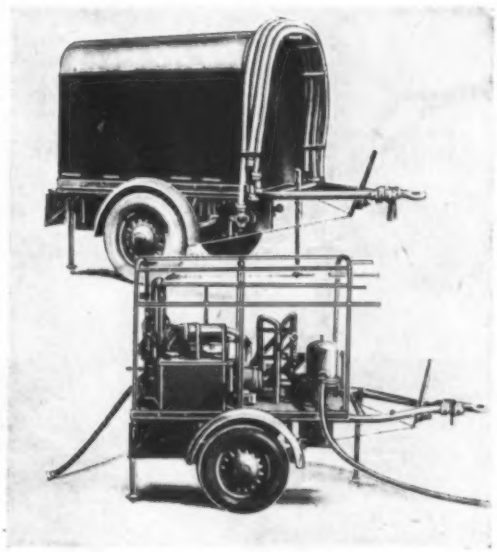
JAP.: The Donryu, a new twin-engined bomber of the Japanese Army Air Force developed during the war. It is an all-metal midwing monoplane somewhat resembling earlier Nakajima types and possibly equipped with Kinsei engines.



GRECIAN YEARNING

To the Greeks water meant refinement . . . civilization . . . life itself. So when Eupalinus devised the water supply to Samos in 625 B.C. he was prepared to drive an eight foot square tunnel nearly a mile through a mountain for his aqueduct.

To-day, fine water can be had with far less labour. Even an inexperienced operator can safely work the E.C.D. apparatus which, by virtue of its unique electrolytic cell, injects exactly the right amount of fresh electrolytic sodium hypochlorite into the water as it is pumped.



Electrolytic sodium hypochlorite is one of the world's finest and safest antiseptics. Scientifically used, it leaves no trace of chlorination, and an overdose has no ill effects. That is why E.C.D. plant gives colourless, tasteless, and odourless water from the most organically polluted sources. . . . That is why E.C.D. plant is ideal for use all over the world and especially in tropical or undeveloped territories.

It is made in sizes which will supply from 500 to 3,000 gallons an hour of water which will be free from all organic or bacterial infection, and which can be used as it is drawn, or which can be stored for many hours without losing its freshness.

Advice on matters relating to water treatment can be obtained from

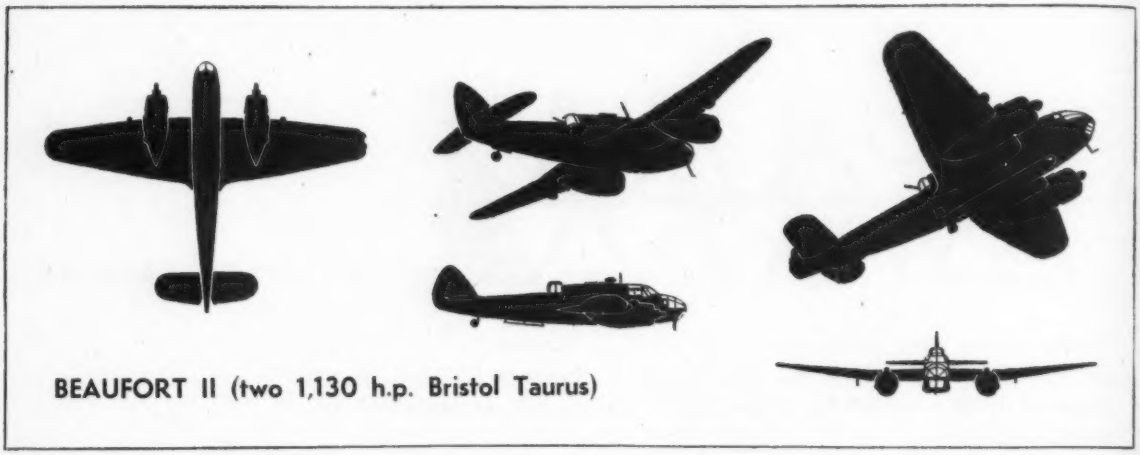
ECD

WATER TREATMENT

E.C.D. LTD · TONBRIDGE · KENT · TELEPHONE: TONBRIDGE 737

Studies in Recognition

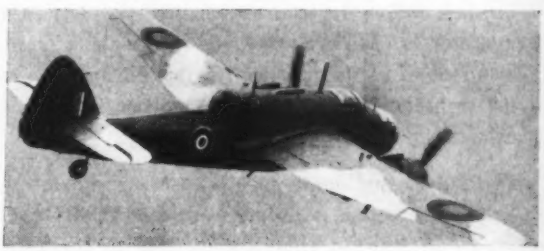
Aircraft in Ri



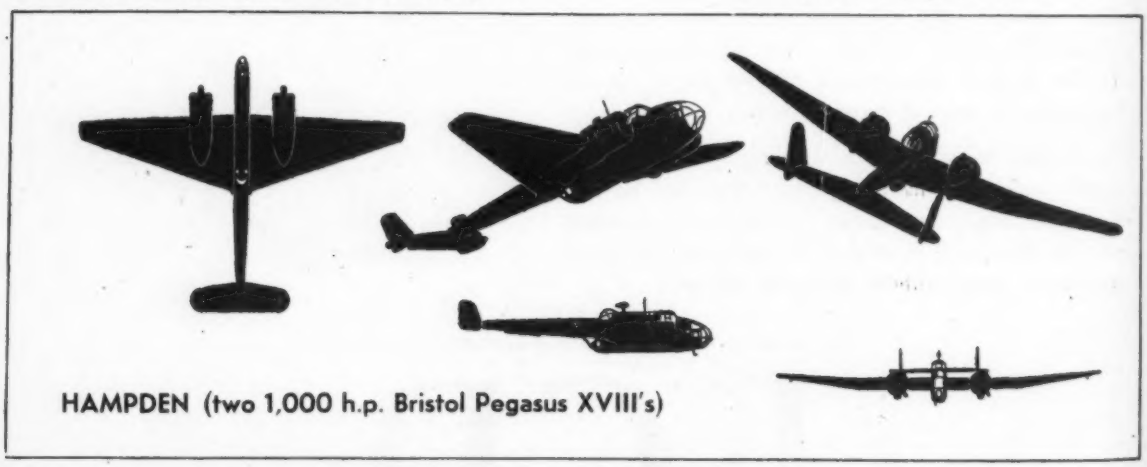
BEAUFORT II (two 1,130 h.p. Bristol Taurus)

DESIGNED to a specification aiming at considerable versatility, the Bristol Beaufort torpedo aircraft is now mainly used by the R.A.A.F., and produced in Australia, equipped with Pratt and Whitney Twin Wasp radial engines instead of Bristol Taurus units. An 18in. torpedo is carried slung in a bay beneath the fuselage, from which it partly protrudes. A normal bomb load may alternatively be carried, and additional bomb racks are provided under the outer panels of the wings. Four machine guns in the wings and two in the power-operated dorsal turret form the basic armament.

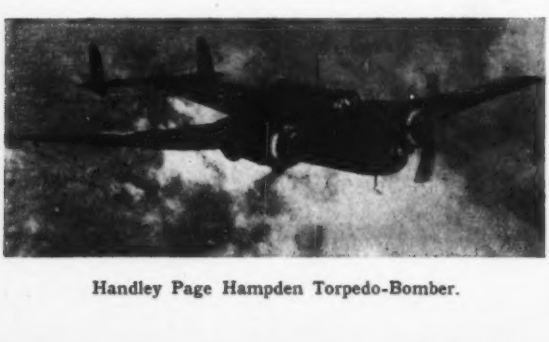
Recognition points include wings and tail unit of characteristically Bristol design, deep slab-sided fuselage stepped down aft of the turret, and oblique optical flats in the nose; nacelles are underslung. Dimensions: Span 57ft. 10in., length 44ft. 2in., height 14ft. 3in., wing area 503 sq. ft.



Bristol Beaufort Torpedo-Bomber.



HAMPDEN (two 1,000 h.p. Bristol Pegasus XVIII's)

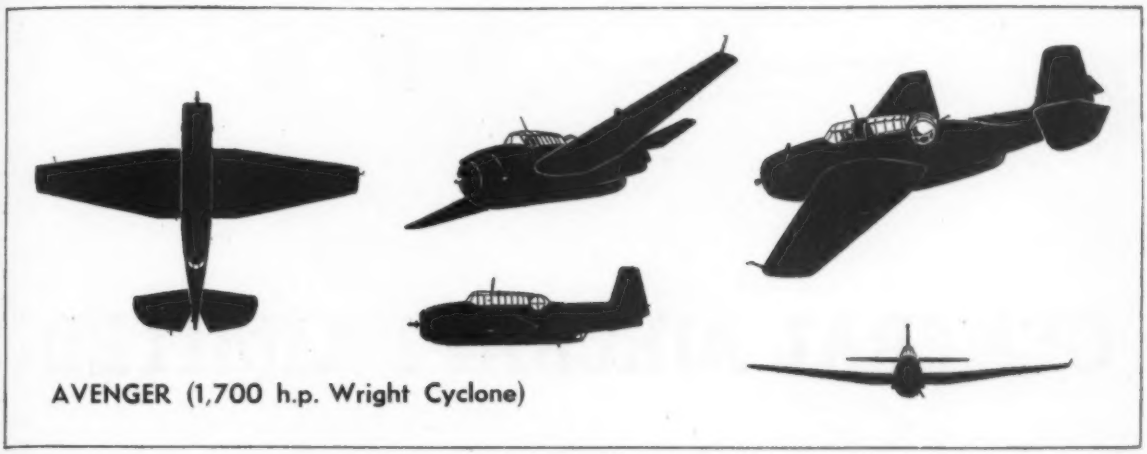


Handley Page Hampden Torpedo-Bomber.

THE Handley Page Hampden has gained a new lease of useful life as a torpedo aircraft and mine-layer. Powered by a pair of 1,000 h.p. Bristol Pegasus XVIII radial engines and carrying its "tin fish" enclosed in what was originally the bomb bay, the Hampden has a top speed of 265 m.p.h. Armament comprises two machine guns in the nose, two in the dorsal turret and two in the ventral position.

It is easily recognised, having an abnormally narrow and deep fuselage which diminishes aft of the gun turret and torpedo bay to a slender boom carrying a round-tipped tail-plane with threaded twin fins and rudders. The mid-wings have a wide flat centre-section tapering in thickness and are forward-swept on the trailing-edge to small angular tips. Dimensions: Span 69ft. 4in., length 53ft. 3in., height 14ft. 11in., wing area 737 sq. ft

...ying Attitudes

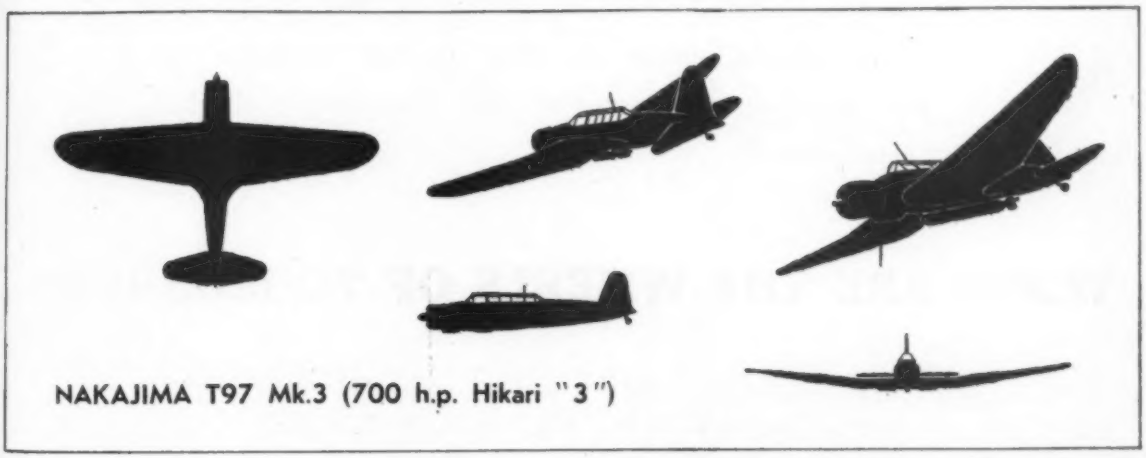


AVENGER (1,700 h.p. Wright Cyclone)

Grumman Avenger Torpedo-Bomber.

THE Grumman Avenger is America's *dernier cri* in carrier-borne torpedo aircraft and the type is now being supplied to the Fleet Air Arm as well as the U.S. Navy. The engine is a 1,700 h.p. Wright double-row, 14-cyl. Cyclone and top speed is about 270 m.p.h. Carrying a 22in. torpedo, the Avenger has a reasonably good defensive armament consisting of three 0.5in. machine guns firing respectively from a bubble turret at the rear of the "glasshouse" covering the cockpits, from a ventral position aft of the torpedo bay, and from a blast trough on the starboard side of the nose.

Recognition points include square-tipped wings tapering from a flat rectangular centre-section, large area tailplane with curved trailing-edge and tips, and large angular fin and rudder. Dimensions: Span 54ft. 2in., length 41ft., height 16ft. 5in., wing area 504 sq. ft

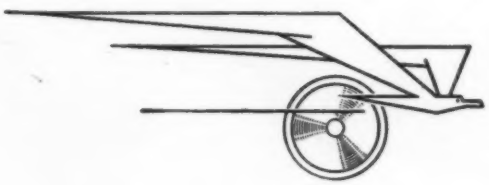


NAKAJIMA T97 Mk.3 (700 h.p. Hikari "3")

BEARING an obvious resemblance to a Northrop, the Nakajima T97 Mk.III Navy torpedo-bomber, which has the S.W. Pacific code name of *Kate*, carries its 18in. torpedo at an angle to the underside of the tapered fuselage. Power is supplied by a 700 h.p. Hikari "3" 9-cyl. radial engine in a short cowling and top speed is 195 m.p.h. Later versions may have the 900 h.p Kinsei engine, giving a top speed of 225 m.p.h. Two 7.7 mm. machine guns in the cowling and two more in the aft cockpit comprise the armament.

Recognition points include wide-span tapered wings of large size for the fuselage, dihedral from a flat rectangular centre-section with large fillets, wide, well-tapered tailplane, fairly small round-topped fin and rudder, and long "glasshouse." Dimensions: Span 51ft. 1in., length 34ft. 6in., height 12ft. 4in., wing area 370 sq ft.

Nakajima T97 Mk. III Navy Torpedo-Bomber.



GENERAL AIRCRAFT LIMITED

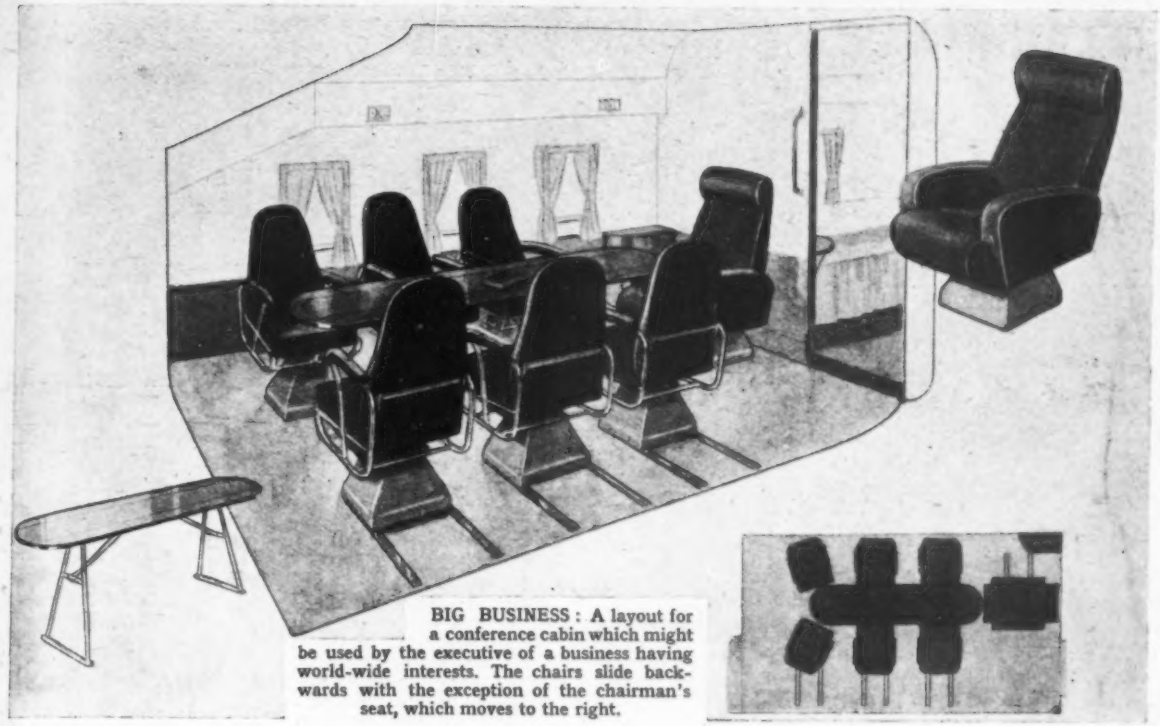
The full story of war-time production problems and their solution will one day make interesting reading. The lessons learnt will be invaluable in the days when construction instead of destruction becomes the driving force of industry.

General Aircraft Limited are storing for this future the knowledge gained by their constant research and practical experience in the manufacture of fighter aircraft.

WINGS ARE THE WHEELS OF TO-MORROW

GENERAL AIRCRAFT LIMITED
LONDON AIR PARK, FELTHAM, MIDDLESEX
Feltham 3636 (12 *lines*)

Overseas enquiries to our Export Division :
ENGINEERING & AVIATION EXPORTS LTD., 50 PALL MALL, LONDON, S.W.1. Telephone: Abbey 6210



BIG BUSINESS: A layout for a conference cabin which might be used by the executive of a business having world-wide interests. The chairs slide backwards with the exception of the chairman's seat, which moves to the right.

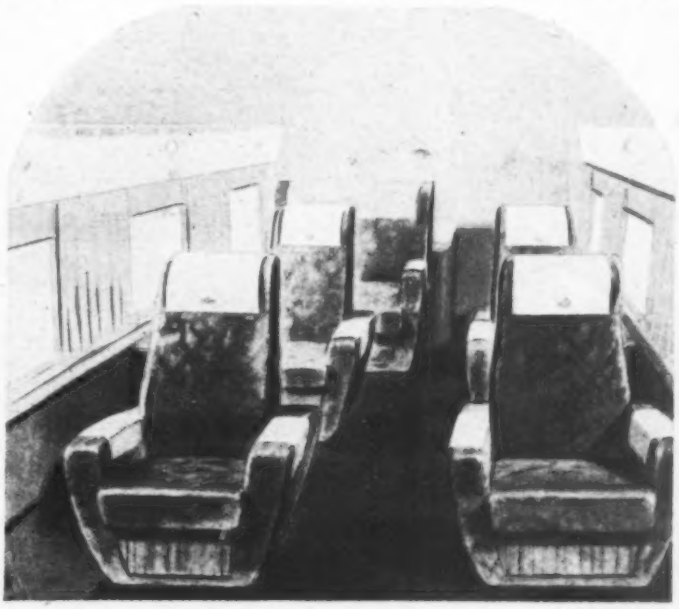
Comfort, Quiet and Elegance

Sound-proofing, Seating and Interior Decoration of Aircraft as Installed by Pioneer Concern

TIME was, and not so very long ago, when aircraft designers personally designed their entire machines from airscrew boss to rudder. Nowadays we have specialists for almost every part and function. A chief designer's work now lies mainly in the acceptance or rejection of the components which make up his original conception. Although it does not affect the performance of a machine, the interior has also become a highly specialised business; so much so that it is no longer economical for each aircraft firm to maintain its own furnishing department. It is now customary to entrust such work to outside experts. Here is a story of how the best-known firm in England came into being, together with a brief description of how the work is done.

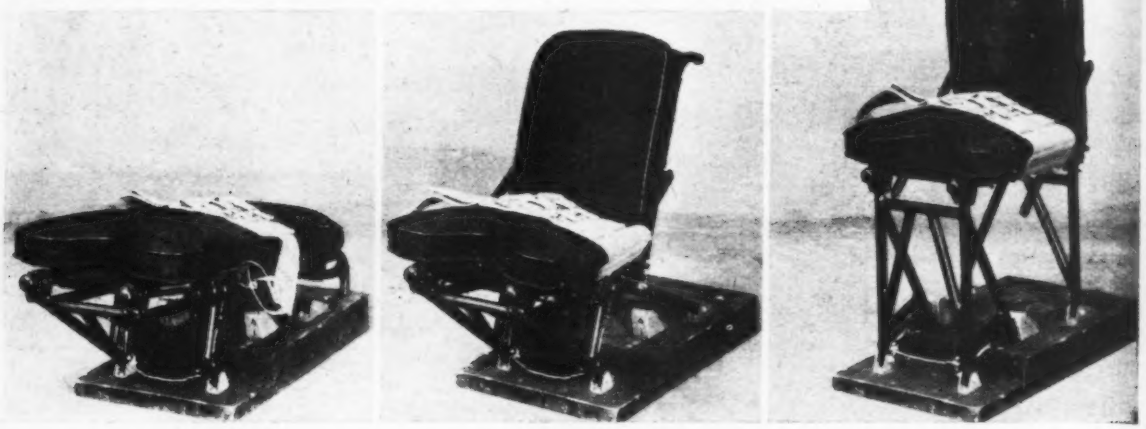
How many of our readers, we wonder, remember the spate of Gordon-England bodies fitted to cars some 16 or 17 years ago? They were quite famous for their comfort, shapeliness and lightness.

One day Capt. Geoffrey de Havilland (as he then was) brought a Puss Moth over for Gordon-England to see. Certain suggestions for interior decorations were offered by Mr. L. A. Rumbold, who was then Gordon-England's works manager. The upshot of it all was that de Havillands no longer did their own interior fitting, but decided to leave it to experts. When the Gordon-England Company closed down Mr. Rumbold established his own business as a specialist. Since then every D.H. aircraft has been fitted-out by his firm, and it is true to say that nearly every other British aircraft of note has passed through his hands. For in-



The artist's layout of the cabin of the D.H. Flamingo built for H.M. the King before the war. It was designed by Walter Goodesmith, A.R.I.B.A.

COMFORT, QUIET AND ELEGANCE



The three positions of the prone air-bomber's seat as fitted in the Handley Page Halifax.

Mr. L. A. Rumbold, who is the founder and managing director of the company which bears his name.

stance, all the Imperial Airways and B.O.A.C. machines have been equipped by him with the exception of the chairs, which are to the airline company's own design.

Damping Bad Areas

It is interesting to see how the fitting-out of a cabin is tackled. From either the constructing firm's mock-up or drawings the general colour scheme, furnishing and seating plan is made. Then a representative of the company, usually Mr. Rumbold himself, makes several flights in the empty shell of the prototype. While in the air, he crawls all over the machine looking for sources of trouble. An unsupported panel here or a sixteenth of an inch opening there can cause more noise and vibration than is made by the engine exhausts. A particularly fruitful cause of trouble in modern machines is the main spar passing right through the body structure. Unless this area receives very special attention from sound-damping devices, all the mechanical noises from the engines and airscrews are brought right into the cabin. (It was because of this fact that the Short Empire flying boats proved so quiet inside. The main spar goes through the top deck, and it was comparatively simple to insulate the cabin therefrom.)

All these bad areas are attended to as they are found. For instance, if the outside skin is carried on stringers on the outside of the fuselage formers, it is necessary to fill the gaps with some vibration-absorbing material. Some troubles can be cured by rubber mountings; thicker glazing

EARLY PATTERNS: (Left) **A Rumbold air chair of about 1929 vintage. It was in real leather on a framework of Elektron tube. The weight, 10 lb., had to come within a definite allocation. Seat and back were both adjustable. The other seat shown here is one of more generous proportions developed for the 10-seater commercial Blackburn of 1933. Weight was 12½ lb.**

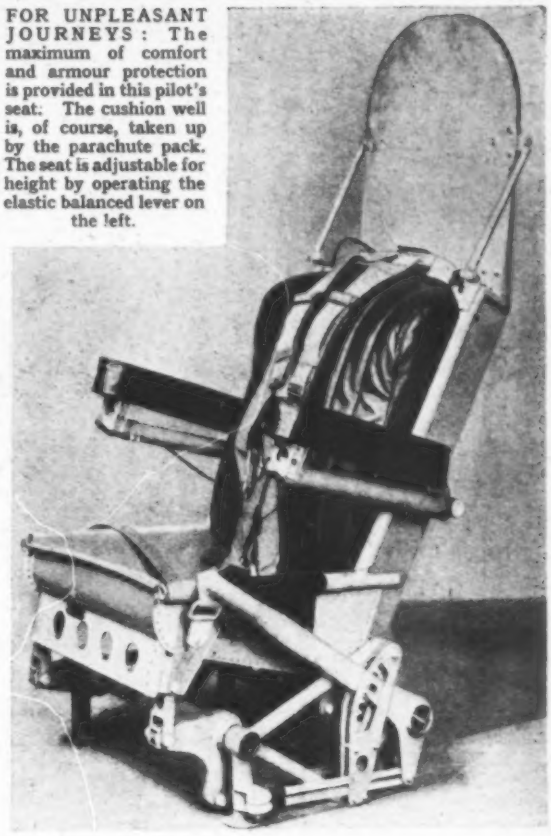
material for the windows will cure other noises. Ventilation shafts are essential, but a pulsating slipstream is a noisy source of fresh air. The air ducts are lined with fur, and thus another source of trouble is eliminated. When—usually after about six flights—all the bad areas have been treated and normal readings have been obtained on a decibel meter, furnishing proper is begun.

This would appear to be a comparatively simple task, since in normal times a multiplicity of fabrics and materials are available for decoration. This wide range is actually more apparent than real because in aircraft furnishings no fabric ever has the sole job of just looking well. It must add its quota to the further general noise reduction; it must also be a good heat insulator, non-inflammable, non-hygroscopic and even insect-proof. In addition to these qualities it must be able to stand polar and tropical climates in rapid succession without deterioration.

Furniture Requirements

Air furniture and the layout of toilets and cooking galleys lend themselves to much original thought. Chairs must be light, durable, robust and ultra comfortable, preserving at the same time that air of expansive solidity so beloved of the Englishman. In addition to these qualities, the chairs have to be quite complicated mechanical structures because each must have an adjustable angle of recline, an independent head rest, and storage provision for an oxygen economiser, flotation jacket and oxygen mask. When all these wants have been satisfied a final demand is made in that the whole seat shall swivel through 360 deg. and yet, in its normal position, not require more than 4in. clearance between it and the cabin wall.

Needless to say, such super efforts as have been described are during wartime reserved for what are known in the Transport Command as Vips (Very Important Personages) and the company's main work to-day lies in providing reasonably comfortable and very ingenious seating for our military aircraft. There are just plain swivelling seats, swivelling seats that fold forward and slide under the table, seats that kneel and lie down for prone air-bomber's use, and pilot's seats that rise and fall and give a maximum

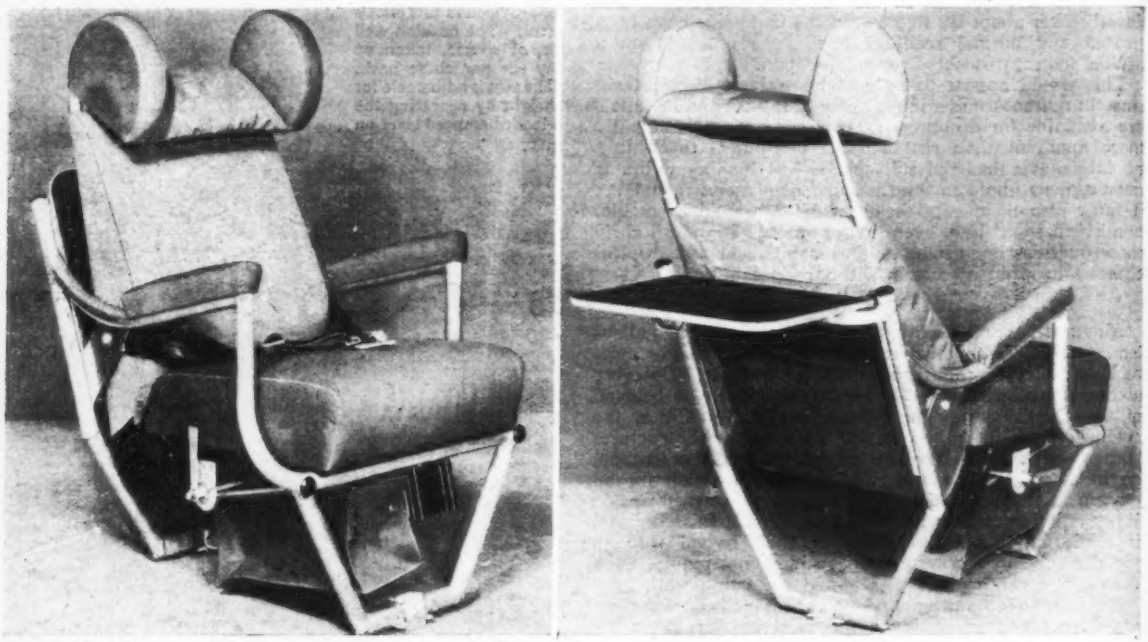


FOR UNPLEASANT JOURNEYS: The maximum of comfort and armour protection is provided in this pilot's seat. The cushion well is, of course, taken up by the parachute pack. The seat is adjustable for height by operating the elastic balanced lever on the left.

ALL ENCLOSED: This was a first attempt to enclose the Elektron tube framework in fabric and to make the chair look as well as feel comfortable. The back was adjustable for comfort by pressing a spring-loaded button on one armrest. It was mounted on anti-vibration floor fittings and weighed about 18 lb.

THE MODERN TOUCH: The type of seat which can be expected in long-range airliners after the war. At present only a very few are made for very special purposes. Like the others it is basically a welded light-metal tube framework but covered and padded to provide the last degree of comfort and convenience. The footrest pulls out to support the whole length of the legs. Weight 49 lb.

COMFORT, QUIET AND ELEGANCE



WARTIME FIRST-CLASS : Two views of the standard seat fitted in present-day British airliners. It is very comfortable despite the absence of trimmings. Beneath the seat can be seen the oxygen economiser and the case for the flotation jacket and oxygen mask. The table stows vertically in runners in the back of the chair.

of comfort without getting in the way of any of the flying controls.

All the air furniture, whether for Service or civil requirements, is basically of welded light-metal tube construction, and it is somewhat of a revelation to go through the shops and see the excellent quality of the welding work done by girls who have been trained in the company's own school. It must be remembered that it was but a short while ago that light-metal welds could only be handled by the most skilled and experienced men.

To finish on the same note as that on which we started this article, interior economy as visualised by the experts has already become such an intricate and specialised business that it is the Rumbold Company's intention to break down the organisation into four entirely separate departments, with a master department to co-ordinate their efforts.

The four divisions will deal with (1) layout, design, colour and materials; (2) comfort and the mechanical aspects of seats, tables, chairs and other furniture; (3) acoustics and sound-proofing; and (4) design and layout of kitchen and toilet equipment.

P-38 OUTPUT TO BE TREBLED

CONSIDERABLE acceleration in the production of the new long-range Lockheed P-38 Lightning, mentioned in *Flight* last week, has been announced by Mr. Robert E. Gross, the company's president.

This acceleration, which involves an expansion programme running into hundreds of aircraft per month, is being achieved by sub-contracting the construction of component parts on a large scale and concentrating the major part of the Lockheed facilities on final assembly at Burbank.

Dozens of manufacturers all over the U.S. are embraced in the scheme, and they range from Consolidated-Vultee Aircraft —which is to produce wing sections, aft booms and engine mountings in its Nashville and Downey plants—to a Los Angeles firm of showcase and fixture manufacturers. The Hudson Motor Car Co., of Detroit, is included among the sub-contractors.

Mr. Gross stressed, in his recent statement, that the programme, which is to treble the present production rates of Lightnings, will have to be achieved without loss of current production, and Lockheed is to continue its present output of P38 fighters while furnishing master tooling and all necessary data to the sub-contractors who are still being selected. Then, as these "daughter" firms gradually take over the load on the various components, Lockheed will "taper off" in these departments and devote the released facilities to the final assembly of the steadily increasing numbers of aircraft. Lockheed, however, is to continue to construct the nacelle, forward booms and tail unit, and two of the firm's Californian plants will be devoted to packing, shipping and tooling as the scheme gets into its stride.

Incidentally, the man-hours on the P-38 have been halved since the 300th aircraft was built.

NEW U.S. CARRIER LAUNCHED

THE *Shangri-La*, the U.S. Navy's new aircraft carrier whose length equals that of the longest ship ever built in the United States, has been launched at the Norfolk navy yard at Portsmouth, Virginia.

The *Shangri-La*, built with money obtained in a nation-wide war bonds and stamps campaign, is a 27,500-ton ship of the Essex class with modifications, and some 750,000 man-days were required for her construction.

At launching, she had a deadweight of 20,500 tons, her welding totals 270 tons, and the number of rivets is 292,600; twenty tons of grease were required for the slipway.

Sponsor of the carrier was Mrs. James H. Doolittle, wife of Major General Doolittle, now commander of the U.S. Eighth Air Force in England, who led the Tokyo raid.

The carrier gets its name from the Tokyo attack. At a press conference following its announcement, a reporter asked President Roosevelt where the bombers had been based. Alluding to the fictional land of James Hilton's novel, "Lost Horizon," the President replied that the bombers took off from a secret base in "Shangri-La." Subsequently it was announced that the bombers had taken off from the aircraft carrier Hornet which was sunk in the battle of Santa Cruz, east of the Solomons Islands, on October 26, 1942.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

JET PROPULSION

Efficiency of Axial-flow Compressors

REFERRING to the issue of *Flight* dated February 17th, 1944, and to your article on "Gas Turbine Power Plants," after examining the sketch by your artist, Max Miller, the type of axial flow compressor depicted will absorb, as you say, approximately 75 per cent. of the available power, which is ridiculous when there are other types of axial blowers that absorb only 1/200th of the power available. The mixing chambers are unusual and would be highly inefficient, but the flame grid bars would infringe patents. A power unit of the type you suggest at 3,000 r.p.m. instead of anything up to 10,000 r.p.m. with a fuel consumption of approximately 0.0078 lb. of fuel of a B.T.U. value of 18,000 per injection will compete favourably with any reciprocating or C.I. engine. It is to be noted that foresight has been given to your sketch by attaching the conservative airscrew, and the time is not far distant when the turbine power unit will be available for a variety of propulsion purposes on an economical basis.

G. W. STANLEY.

A Simple Explanation

HOW long will it take, I wonder, for the majority of interested people to understand, finally and without question, the operative principle of jet propulsion?

May I shove my oar in? Then with your indulgence:

The propulsive effort obtained from a jet power unit (whether fitted to an aircraft, autocycle or lawn mower) is derived purely from the reaction of the force exerted in ejecting the jet. Just that and nothing more.

Without dashing into the specious realm of mathematics, probably the clearest analogy is provided by the operation of a gun or rifle. Consider a rifle freely suspended in space with some remote control method of firing it. When the charge is fired, a given pressure is generated in the breech a portion of which is expended in ejecting the bullet along the barrel; the remaining portion of the force generated is expended in moving the whole rifle backwards in an opposite direction to that taken by the bullet (that is, the recoil).

If in place of a rifle one substitutes a jet aircraft, the bullet becomes the jet ejected, and the recoil becomes the forward motion of the machine. The main difference is that the jet aircraft has a constant combustion and therefore continued motion, whereas the rifle has spasmodic combustion (only when it is fired) and therefore a like recoil motion.

"AFFLATUS."

Yet Another Explanatory Analogy

STRANGE how long it takes to dispel the fallacy that the propulsive force is derived from the rearward-driven jet "pressing against the surrounding air." It is well known that such is not the case.

Propulsion is derived from the *reaction* caused by *accelerating a mass* of gases rearward, the reaction being in the opposite direction—forward.

There is no mystery about the reaction. Imagine a man seated on the ground, knees drawn up and feet planted against a 200lb. rock. His back is against, say, a wall. By straightening his legs he exerts a force on the rock and pushes it away from him, thus *accelerating a mass* (of rock).

In order to exert this force his back is pressed against the wall. This pressure is the *reaction*, and is the simple natural result of his action in pushing the rock away. If his back were against another 200lb. rock instead of the wall, it is probable that both rocks would move as a result of his exertion.

So in the jet-plane. The power plant may be likened to the man, the rearward-driven mass of gases to the 200lb. rock, and the aircraft itself to whatever the man is bracing his back against. The mass of gases is pushed rearward, and unless the aircraft is anchored it will move forward.

It is also a fact (your correspondent R. L. Gladwell may be interested to know) that J.P. aircraft do not "fly at great heights with little reduction in speed." Their speed increases with altitude, for although the *reaction* which drives them can be maintained, the drag decreases owing to "thinner" air.

The "intake suction" mentioned by N. V. Brittain is no more a part of the driving force than it is on an orthodox engine and aircraft. In fact, at high speeds considerable "ram effect" is experienced, which improves the output of the blower (compressor).

It must also be obvious that a J.P. aircraft could not operate in a vacuum. Where would it obtain the air to burn, or to give lift to its wings? It should be equally obvious (and is an equally well-established fact) that a rocket *will* operate in a vacuum. It requires no oxygen from the air to support the combustion of its fuel, which is self-sufficient and anyway burns in an enclosed airless chamber. Inasmuch as a rocket is lifted without wings, simply because it is aimed upward, it would naturally travel faster in a vacuum (if such condition were possible), where drag would be non-existent.

Again it is the *reaction* of expelling or *accelerating a mass* of gases which sends the rocket skallyhootin' through the sky. In short, to move a mass (of anything) you must exert force against something. If that something happens to be a rocket which is not nailed down, the rocket gives way.

As Archimides said: "I could lift the world with a big enough lever—if only I had some place to stand!" Or words to that effect.

R. H. HENDERSON.

Relative Overall Efficiency

MAY I congratulate you upon the complete justification of your 1941 campaign for jet propulsion. It is surprising after all you have written about direct-reaction drive that so many of your correspondents still miss the point, namely, that a J.P. aircraft pulls itself up by its own braces and not by kicking back against the surrounding atmosphere. Even the de Havilland advertisement No. 16 does not state the case quite clearly enough when it talks about throwing stuff back instead of about the reaction against the structure of the throwing back of that stuff. The picture would perhaps be clearer if the formula for efficiency were based on Jet Speed instead of Slip Speed, thus—

$$R=\frac{J}{V} \text{ and } E=\frac{2}{1+R}$$

But in any case, comparison between J.P. and airscrew drive is useless without reduction to the final expression of overall efficiency. Orthodox aircraft engines show anything from 25 per cent. to 30 per cent. efficiency. Diesels go up to 35 per cent. In both of these considerable mechanical energy is lost in conversion and transmission, auxiliaries, exhaust, etc. With a compressor/turbine unit, where the only mechanical energy taken out is for an auxiliary, namely, the compressor drive, i.e., where the main source of energy required and available is in the exhaust gases, and where, also, the mechanical energy taken out is already in the desired state of rotary motion at the source where it is tapped and passed from rotor to co-axial compressor, the thermodynamic efficiency should be at least equal to that of a diesel. Axial-flow compressors have been constructed with 90-92 per cent. efficiency criterion and an annular or spiral combustion chamber cannot impose more than 2-5 per cent. loss by shock and turbulence. Turbines giving 90-95 per cent. output are not unknown provided the gases are fully expanded at the outlet.

The paradox is that full expansion means high outlet speed, which in turn means lower efficiency of propulsion, and if it is not sufficient to find a compromise between these two factors, I would suggest borrowing ideas from several of your correspondents, "Projet," "Ne Fronte Crede," and J. K. Haviland. Increase the mass of air handled by sucking off the boundary layer and turbulence on wings and fuselage by means of ejector effect around the jet.

"LAYMAN, UNQUALIFIED."

THE DUCTED RADIATOR

A Form of Jet Propulsion

IN answer to your correspondent, R. D. Morrell, in January 27th issue of *Flight*, the theory of the ducted radiator can be defined as follows:—

The ducted radiator as incorporated in present-day cooling systems uses cooled air moving at a much lower velocity through the radiator than the forward velocity of the machine. The cross-section of the duct increases in area to the radiator position, and decreases to the outlet. The velocity of the air

CORRESPONDENCE

diminishes as the duct area increases until at the radiator it becomes a minimum.

The lower velocity air passes through the radiator tubes with reduced friction and carries off the surplus heat, so that atmospheric temperature is increased in consequence. In this manner not only may the cooling drag be eliminated, but a forward propulsion effect is produced at high speeds.

The system may be regarded as a heat engine with a definite cycle of operations. The air entering the opening is subject to compression as it slows down until at the radiator the pressure is at its maximum. At the place of maximum compression the air receives heat and is expanded from the radiator to the outlet. In effect the system acts as a kind of jet propulsion the strength of which increases with the speed of the machine.

The thermo cycle of operations consists of an alternate addition and subtraction of heat, in this case the heat in question being supplied by the radiator and extracted by the air entering the duct at low temperature. This gives the alternate addition of heat (Q) and subtraction of heat (R), so that if W be the useful work W equals Q minus R.

A. L. FEARMAN.

MERLIN MYSTERY

Two Causes of Blow-back

THE kick-back on the throttle (Merlin) mentioned by several recent correspondents may be due to:—

"Blow-back" caused by (a) excessive valve overlap; (b) bad scavenging due to faulty exhaust system design.

The existing practice of short stubs in exhausts does not help exhaust inter-extraction at low speeds; also excessive overlap is conducive to carburettor fires at low speed. With an exhaust system which allows a certain portion of the exhaust to be trapped in the combustion head, blow-back occurs as soon as the inlet valve opens—especially if the opening is much before top dead centre.

I have had flames a foot long blow back through the carburettor air intake of a 3-litre car because of too little tappet clearance. Increasing this from 0.004/0.006 to 0.008 stopped it without affecting noise much—in any case, power was the goal!

"VIEWER."

FLYING INSTRUCTORS

They Deserve Better Recognition

WITH so many units of the various Services putting forward claims for the 1939-43 Star, is it not time that that oft-forgotten branch—the flying instructors—was recognised?

Many of the instructors have been on the job since the outbreak of war; others, against their wishes, were given the duty after completion of their wartime pilot's training.

And a large percentage after a period of instructing in England were sent to a Dominion to carry on the work for a period of two years.

Returning now to England, and at last getting their wish to become operational, they find that many of their ex-pupils with the 1939-43 Star are apt to look at them in rather a superior way.

I for one will always remember with gratitude the forethought and patience of my flying instructor.

"EX-PUPIL."

"THE STUDENT'S POINT OF VIEW"

Voiced Through R.Ae.S. Discussions

WITH reference to the article entitled "The Student's Point of View" and the editorial comment thereon published in your issue of February 3rd, we wish to call your attention to the following points:

First, that the Royal Aeronautical Society during the last year has held two public meetings under the chairmanship of Dr. H. Roxbee Cox, Fellow and Vice-President, to discuss the education and training of the aeronautical engineer. At the second of these meetings a resolution was passed containing a recommendation to the Council of the R.Ae.S. that it endeavours to arrange for a committee to be formed to draw up a plan for the training of aeronautical engineers of all kinds, bearing in mind the qualitative and quantitative requirements of the industry. This committee was to include representatives of, or take evidence from, a number of interested bodies, among them being *students*.

Secondly, the Graduate and Student Section of the Society has itself held a similar discussion, again under the chairmanship of Dr. Roxbee Cox, and has passed the following resolution:

"That the meeting of the Graduates' and Students' Section of the R.Ae.S. held on Wednesday, December 15th, 1943, endorses the recommendation of the two previous meetings of the Society, and asks that a record of its discussion be brought to the attention of the Council of the Society and of Sir Roy Fedden's Committee.

We wish, therefore, to refute your statement that the student has had no say in the matter of the education and training of the aeronautical engineer, and that whether or not students have been consulted, their collected opinions as expressed in full discussion are on record, and will be brought to the notice of the appropriate authorities.

W. C. J. GARRARD, B.Sc., Ph.D., Chairman.
E. J. N. ARCHBOLD, B.Sc., Hon. Secretary.
(Graduate and Student Section, R.Ae.S.)

Time Factor in Training

ALTHOUGH B. J. Stedman has made the same mistake in "The Student's Point of View" as the writer of the Editorial "Whence the Chiefs?" in *Flight* of February 3rd, yet the true situation would be well met by the scheme proposed by the former.

Both have surveyed the problem, so to speak, in three dimensions only and have overlooked the time factor, which applies in two ways, i.e., (1) the period a student is prepared to spend in absorbing the various subjects he ought to absorb, and (2) the feasibility of the Chief's spending consecutive periods with different groups of specialists, so that they can explain to him and discuss with him and get his interim decisions, and the final one, in each department of design, until the Chief ends by being a temporary specialist in the one particular aircraft involved.

In short, the best man is the best absorber, both during training and during designing. Therefore, because of this overlooked capacity of the human brain to forget a lot and absorb a lot from time to time, the only interfering obstacle is the shortness of time, and the more time presses the more one must accept "functionalising" not only for students but for the Chiefs in "the speeded-up tempo needed in post-war industry." But the best Chief is the man who can absorb quickest and is least forced to functionalise, and maybe your Editorial writer would say this is the "superman" he hopes for.

Besides absorbtion and functionalising there is a third necessity, i.e., research, which, by its very nature, is best done by non-industrial institutions subsidised by the whole industry or, better still, by many industries.

In my contribution to the discussions organised by the Royal Aeronautical Society on June 25th and July 23rd last year I proposed a comprehensive national scheme making the best use of evening classes and university colleges and some institute like that at Duxford. This scheme would seem to fit in quite well with the above three necessities.

R. C. ABEL, Lieut. (Sp.), R.N.V.R., A.F.R.Ae.S.

TYPHOONS v. JUNGMANNS

Pupils Become Fully Fledged Pilots

I HAVE just finished reading your *Flight* of January 20th issue. It is an extremely interesting magazine, especially the article on Typhoons.

The chief reason I am writing to you is to "blow off some steam" after reading Mr. Ian S. Alexander, Stud. R.Ae.S.'s letter on "Typhoons v. Jungmanns."

Yes, Mr. Alexander, *you* can sit back and shake your head and say that it isn't the sporting thing to do but have you ever stopped to consider that some day those very same students will be full-fledged pilots of the *Luftwaffe*. It probably doesn't mean anything to you and many others, but some day may be your best friend might not show up. . . . Why? Because some soft-hearted armchair general said, "Shooting down trainers isn't cricket."

This is war, Mr. Alexander, so if it is an enemy, "Blast him out of the sky."

"JUNIOR"
(R.C.A.F. Pilot).

Gas Turbines and Jet Propulsion for Aircraft
By G. GEOFFREY SMITH M.B.E

A second edition of the above booklet is now available from "Flight" publishing offices. The new work consists of ten chapters and includes many illustrations. Price 3/6 plus 3d. post.

Topics of the Day

Simplification and Safety

More About Planned Control Layouts : The Need for the Careful Segregation of Important Items : "Practical Untidiness" : Why Not Automatic Undercarriage Retraction of High-efficiency Types?

DURING the last year or two there has been a comfortingly increasing desire amongst designers of engines and airframes to simplify the work of the pilot, but it almost begins to seem at times as if "automatics" are being overdone in rather the wrong direction. Instead of designing an aircraft so that an intelligent pilot is helped to make the best use of his limited number of hands and feet in harassing situations, the experts are tending to give him aircraft which can be handled satisfactorily even by a well-trained ambidextrous moron.

More than once I have enlarged on the need for control simplification and standardisation, and have made a few good and bad suggestions in an attempt to help earthbound designers to visualise the sort of things that are needed. Nothing very much has been done on these lines—lines that are considered by the pilot to be the most important of all—and yet quite a lot in the little matters of engine control for maximum economy and efficiency on long flights. Not that these lines are good or that it isn't vitally important to make an engine foolproof in the way of preventing the pilot from using weak mixture at rated boost, for instance, or from leaving the mixture control in "weak" while coming in to land, or from exceeding the permissible maxima in boost and revolutions. That had been done before, with constant-speed airscrew stops and lever-trip mechanisms.

But completely automatic mixture arrangements, automatic blower-engagement devices, and automatic revolution-setting systems do not strike me as being quite as necessary or useful as any possible system by which the take-off drill, to mention only one thing, can be simplified. While only just airborne the pilot must then go through a series of movements which may even involve changing the control-hand and which always involves a good deal of juggling; yet, later on, when he has all the time in the world to think about things, his simple little engine-control setting jobs are now done for him. As I've just said, the present-day aircraft appears to have been designed more for the benefit of the ambidextrous moron—the pilot who can be taught to go through a series of complicated movements with his hands and feet, but who is not considered intelligent enough to use his weak mixture control properly, or to change the blower gear at the right sort of altitude.

Cockpit Drill

Surely the cart has been put before the horse? It is easy enough to train someone in the essentials of engine-handling—and, anyway, a large notice can always be pasted up somewhere in the cockpit so that the most moronic individual, except when involved in combat, couldn't fail to do things in the right way. But a great deal of concentrated training is necessary before any human being has mastered the intricacies of the take-off and approach "drill" on different types, with the various controls placed, as they so often are, in the most awkward positions.

Speaking for myself, I would much rather be left to look after blowers and mixture controls in my own good time, and an entirely automatic mixture system quite often involves a "flat spot" in the throttle range where the mixture is too weak for the boost in use—with a consequent rise in engine temperatures if this part of the throttle movement is not studiously avoided. But that is by the way: I'm not complaining about the "automatics" already introduced, which are undoubtedly for the best in the best of all possible worlds, but about the lack of "automatics" and sometimes even of intelligent planning in matters which I, at least, consider to be more vital.

Though their layouts are usually good, if only in a theoretical sort of way, American aircraft are the worst offenders so far as overloading a harassed pilot with "drill" is concerned. It is not so very long since the pilot of an American aircraft had to deal with a progressive type of mixture control, and he still, more often than not, had to take off with one eye on the boost gauge, and at a third throttle, because no automatic boost control was fitted. And there are always, in American ships, about three more points to deal with before the take-off, quite apart from the seemingly unnecessary "switchery" littering the place. One usually, for instance, has to switch on the battery and the electrically operated instruments, as well as to fiddle about with the series of ingenious tumbler switches which operate the doping system and the inertia starters. Since the aircraft is not yet on the move, with temperatures going up and green lights being impatiently flashed by flying control, these items are not a worry and the layout certainly has its good features. But no well-designed aircraft should need a tail-wheel lock (which one furiously engages while already bowling down the runway), and even fuel booster-pumps have not been found to be really necessary in British aircraft with comparable take-off power outputs and consequent high fuel consumption. One can get used to anything, and my contention is merely that it shouldn't be necessary nowadays to *need* to get used to any purely mechanical actions which can be simplified without great difficulty.

Layout Compromise

And even if further simplification is not practicable, it should be possible, in the early stages of design, to ensure that all the essential controls and switches are specially segregated, and so placed that they can be easily reached. British aircraft, for all their apparent untidiness to American eyes, are usually quite good in this respect, though even the "quite good" can always be improved. The fact that one can get used to, and even learn to prefer, any layout in the world is no excuse for slackness. I know that in some aircraft lack of space is a serious problem, and the designer, with the help of the prototype test pilot, can only do his best; that "best" should always be towards segregation, if nothing else can be done, leaving all the less important items to find their own places.

A few months ago I flew a certain American type for the first time, with no one to show me the "taps." I found that the battery and instrument switches were in the middle of a host of other switches of less importance, and I had to obtain the services of a fitter to show me the position of the magneto switch after a prolonged and fruitless search. From any normal seat position this switch was actually hidden from view below a ledge! The undercarriage selector lever, I found, could only be reached when the Sutton harness catch had been released—so one either had to take off with this essential safety device disengaged (at the very moment when one needed it most), or struggle to release the catch, with the undercarriage still down, during the most significant and dangerous moment of the flight. If the engine stops just after take-off one has the choice of leaving the undercarriage down and going over

SIMPLIFICATION AND SAFETY

on one's back with a properly "held" harness, or of doing a safer belly landing and subsequently breaking one's face against the assorted items below the screen because one wasn't held back by the harness. I defy anyone to make a successful choice!

That is, of course, an extreme example and the aircraft in question is not in service. But the experience reminded me once again that undercarriage retraction after take-off is the one action which should, if not actually made automatic, be at least as simple and quick an operation as is mechanically possible. At this moment the aircraft is flying near the stall, the engine or engines are giving full power (and therefore liable to be least reliable), the ground is dangerously near, and quite big control movements are necessary to maintain level flight while holding the aircraft down to gather speed as quickly as possible. With a high-efficiency twin the throttle-hand shouldn't really leave the controls in case one of the engines cuts before a safe single-engined flying speed has been reached, and it certainly shouldn't be necessary to change the stick-hand or even to leave the throttles to their own devices for more than a fraction of a moment.

The situation is not so acute in single-engined types or in big four-engined aircraft, when an engine cut will not necessarily produce an uncontrollable swing, and certainly not a flick roll into the ground, but some kind of automatic device might be applied to all twins and particularly to twins with a high single-engined safety speed.

There should be no insuperable mechanical difficulties involved, and, since the action will obviously be dependent on speed as well as on "load-off" conditions, the risk of damage by any unpremeditated return to earth will be no greater than at present; a second bounce, in any case, is usually caused by the pilot's preoccupation with the business of raising his undercarriage. We already have undercarriage control safety catches working on the "load-off" principle, and fully automatic retraction is only going one stage farther.

Just before take-off the control would be selected to "up" and the mechanism would do the work—with, of course, an emergency override in case something goes wrong. The rest of the undercarriage "drill," including that for the approach, can be quite normal, and the selection will only be automatic with the lever in the "up" position, the weight off the undercarriage, and the speed above a certain pre-determined low level. There doesn't seem to be any particular difficulty or danger involved in the idea, and it will be more than a blessing to the pilots of twins whose observer or what-not cannot reach the control.

We'll see what we shall see.

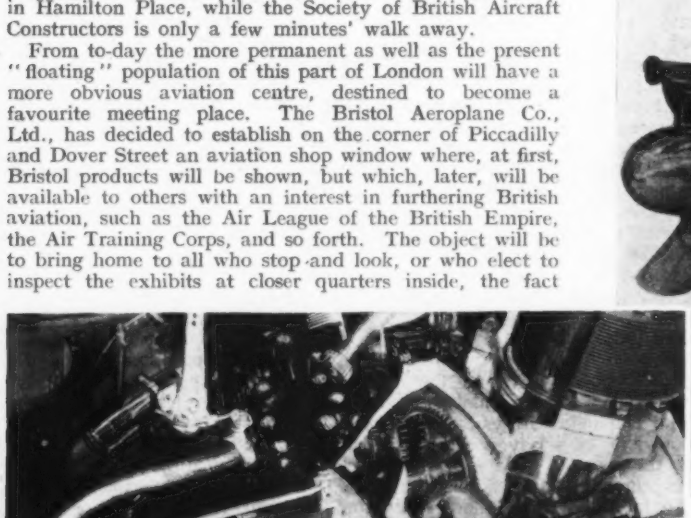
"INDICATOR."

Flying in Piccadilly

Bristol's New Aviation Corner

UNSUSPECTED by the vast majority of passers-by, British aviation has for a good many years been well represented, unobtrusively as befits a "family circle," in the Piccadilly district of London. The Royal Aero Club and the Royal Air Force Club are there, side by side, and the Royal Aeronautical Society is but a few yards away in Hamilton Place, while the Society of British Aircraft Constructors is only a few minutes' walk away.

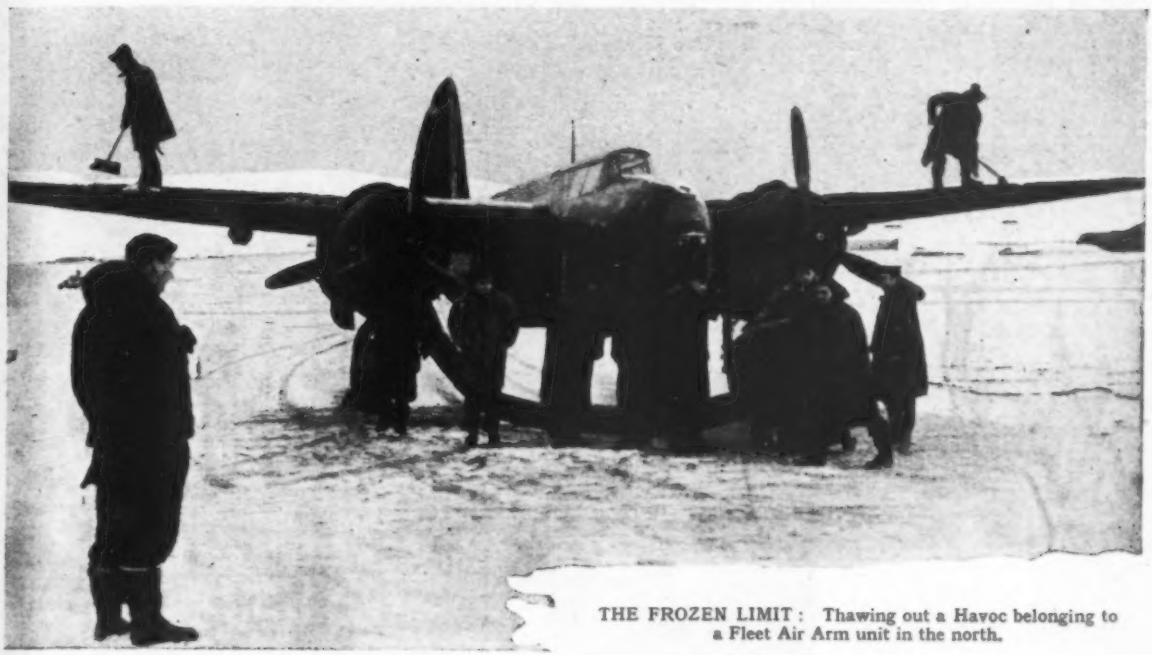
From to-day the more permanent as well as the present "floating" population of this part of London will have a more obvious aviation centre, destined to become a favourite meeting place. The Bristol Aeroplane Co., Ltd., has decided to establish on the corner of Piccadilly and Dover Street an aviation shop window where, at first, Bristol products will be shown, but which, later, will be available to others with an interest in furthering British aviation, such as the Air League of the British Empire, the Air Training Corps, and so forth. The object will be to bring home to all who stop and look, or who elect to inspect the exhibits at closer quarters inside, the fact that aviation is an essential part of the life of the British Empire.



The main exhibit for the first few weeks will be a beautifully sectioned Bristol Hercules engine, run at low speed by its electric starter motor. The somewhat confusing relative movements of sleeves and pistons are shown very clearly, and the working of other parts as well, since even such small items as pumps are sectioned.

"Bristol Corner" is being opened at an official ceremony to-day by Lord Brabazon of Tara.

SERVICE AVIATION



THE FROZEN LIMIT: Thawing out a Havoc belonging to a Fleet Air Arm unit in the north.

Royal Air Force and Fleet Air Arm News and Announcements

Promotions

GENERAL DUTIES BRANCH.

Air Commodores (temp. Air Vice-Marshals) to be Air Vice-Marshals:—
L. D. D. McKEAN, C.B., O.B.E., November 6th, 1943.
R. P. WILLOCK, C.B., February 1st, 1944.
M. HENDERSON, C.B., C.I.E., D.S.O., February 18th, 1944.

Group Captains (temp. Air Vice-Marshals) to be Air Commodores, December 1st, 1943:—
M. B. FREW, C.B., D.S.O., M.C., A.F.C.
R. V. GODDARD, C.B., C.B.E.
R. McENTEGART, C.B.E.
H. S. KEEBY, C.B., D.S.C., A.F.C.

Group Captains (temp. Air Commodores) to be Air Commodores, December 1st, 1943:—
M. THOMAS, C.B.E., D.F.C., A.F.C. (Act. Air Vice-Marshal).
T. W. ELMHIRST, C.B.E., A.F.C. (Act. Air Vice-Marshal).
E. S. GOODWIN, C.B.E., A.F.C. (Act. Air Vice-Marshal).
H. K. THOROLD, C.B.E., D.S.C., D.F.C., A.F.C. (Act. Air Vice-Marshal).

Air Vice-Marshal (temp.) A. B. ELLWOOD, C.B., D.S.C., is granted the rank of Air Commodore (war substn.), January 25th, 1944.

TECHNICAL BRANCH.

Group Captains (temp. Air Vice-Marshals) to be Air Commodores, December 1st, 1943:—
G. G. DAWSON, C.B., C.B.E.
R. S. AITKEN, C.B.E., M.C., A.F.C.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Distinguished Service Order

Flt. Lt. A. I. SLADEN, R.A.F.V.R., No. 58 Sqn.—One night in January, 1944, Flt. Lt. Sladen, F/O. Starr and W/O. Abbey were pilot, navigator and wireless operator/air gunner respectively of an aircraft which attacked a fully surfaced U-boat. In the face of considerable anti-aircraft fire, Flt. Lt. Sladen pressed home his attack from a low level and straddled the vessel with his depth charges. In the operation, which was executed with great skill and accuracy, F/O. Starr and W/O. Abbey co-operated excellently with their pilot. Three nights later this crew attacked another U-boat, which was straddled with depth charges from a low level. Flt. Lt. Sladen, who has completed an extremely large number of sorties, has invariably displayed skill, courage and leadership of a high order. F/O. Starr and W/O. Abbey have also completed very many sorties and have rendered most valuable service.

Flt. Lt. John Williams, air-gunner and paratrooper, who received the D.F.C. at a recent investiture.

Act. Flt. Lt. F. J. GARVEY, D.F.C., R.A.F.V.R., No. 83 Sqn.—Flt. Lt. Garvey has been continuously engaged on operations since January, 1943. Since the award of the D.F.C. he has continued to perform his duties with outstanding distinction and brilliance. During one of his sorties over Essen, a large bomb was hit by anti-aircraft fire after being released and exploded directly beneath his aircraft. Determined to complete his task, despite this hazardous experience, Flt. Lt. Garvey made several runs over this most heavily defended target.

Bar to Distinguished Flying Cross

Flt. Lt. H. C. KELSEY, D.F.C., R.A.F.V.R., No. 141 Sqn.—As pilot and observer respectively, these officers have completed many sorties over enemy territory at night and have destroyed four enemy aircraft. They have displayed a high degree of skill, keenness and determination, setting a very fine example.

Flt. Lt. A. H. TOMLIN, D.F.C., R.A.F.V.R., No. 619 Sqn.—One night in December, 1943, this officer and airman were pilot and flight engineer respectively of an aircraft detailed to attack Berlin. When nearing the target area the aircraft was attacked by fighters and one of the starboard engines was put out of action and it caught fire. Quick work by Flt. Sgt. Brookes extinguished the flames and, although much height had been lost, Flt. Lt. Tomlin flew on to the target and bombed it. On the return flight, Flt. Sgt. Brookes displayed great engineering skill and his efforts proved of material assistance to his pilot in his endeavour to reach this country. On reaching base a second engine failed but Flt. Lt. Tomlin effected a successful crash-landing without injury to any of his crew. This officer displayed outstanding determination and devotion to duty; Flt. Sgt. Brookes displayed similar qualities and proved himself a valuable member of aircraft crew.

Distinguished Flying Cross

F/O. A. J. STARR, R.A.F.V.R. and W/O. J. E. ABBEY, R.C.A.F., both of No. 58 Sqn.—For citation see Flt. Lt. Sladen, D.S.O.

F/O. E. M. SMITH, D.F.M., R.A.F.V.R., No. 141 Sqn.—For citation see Flt. Lt. Kelsey, D.F.C. and Bar.

Act. Flt. Lt. E. G. GENTLE, R.A.A.F., No. 156 Sqn.

Act. Flt. Lt. J. R. KAY, R.N.Z.A.F., No. 224 Sqn.
Act. Flt. Lt. D. H. KENNEDY, R.A.A.F., No. 461 (R.A.A.F.) Sqn.
Act. Flt. Lt. C. R. SAVAGE, R.C.A.F., No. 44 Sqn.
Act. Flt. Lt. R. J. WAGNER, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. G. H. ASH, R.A.F.V.R., No. 138 Sqn.
F/O. R. L. DEVERS, R.A.F., No. 462 (R.A.A.F.) Sqn.
F/O. L. A. FOSTER, R.A.A.F., No. 462 (R.A.A.F.) Sqn.
F/O. A. GLOVER, R.A.F.V.R., No. 541 Sqn.
F/O. L. H. KIRKBY, A.A.F., No. 12 Sqn.
F/O. J. KIRKWOOD, R.A.F.V.R., No. 207 Sqn.
F/O. E. P. LANDON, R.A.F., No. 462 (R.A.A.F.) Sqn.
F/O. R. N. LEEK, R.A.A.F., No. 178 Sqn.
F/O. R. MATTHEWS, R.A.F.V.R., No. 101 Sqn.
F/O. R. MCROBBIE, R.A.F.V.R., No. 57 Sqn.
F/O. J. NAYLOR, R.A.F.V.R., No. 77 Sqn.
F/O. W. ROWLEY, R.A.F.V.R., No. 214 Sqn.
F/O. A. H. RUSSELL, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. H. A. SOWERBUTTS, R.A.F.V.R., No. 540 Sqn.
F/O. W. J. THOMAS, R.A.F., No. 59 Sqn.
F/O. G. H. TROW, R.A.F.V.R., No. 502 Sqn.
F/O. R. C. WILLIAMS, R.A.F.V.R., No. 35 Sqn.
W/O. R. H. BIRKENES, R.C.A.F., No. 462 (R.A.A.F.) Sqn.
W/O. A. E. JEFFREY, R.A.F.V.R., No. 224 Sqn.
Act. W/O. B. W. TURNBULL, R.N.Z.A.F., No. 120 Sqn.
Act. Sqn. Ldr. L. D. LEICESTER, R.A.A.F., No. 158 Sqn.
Act. Flt. Lt. T. S. BLYTH, R.A.F.V.R., No. 51 Sqn.
F/O. R. D. SCHULTZ, R.C.A.F., No. 410 (R.C.A.F.) Sqn.
F/O. V. A. WILLIAMS, R.C.A.F., No. 410 (R.C.A.F.) Sqn.
P/O. R. G. EAGLEFIELD, R.A.F.V.R., No. 158 Sqn.
P/O. J. MAGUIRE, R.A.F.V.R., No. 158 Sqn.
P/O. A. L. MACKENZIE, R.A.F.V.R., No. 51 Sqn.
Sqn. Ldr. F. C. GRIFFITHS, A.F.C., R.A.F.O., No. 138 Sqn.
Flt. Lt. J. A. KING, R.A.F.
P/O. K. F. CORNWELL, R.A.F.V.R., No. 166 Sqn.
P/O. J. HORSLEY, R.A.F.V.R., No. 166 Sqn.
P/O. E. H. J. SAUREZ, R.C.A.F., No. 576 Sqn.
W/O. E. A. BROWN, R.A.F.V.R., No. 77 Sqn.
Act. Sqn. Ldr. B. S. JONES, R.A.F.O., No. 684 Sqn.
F/O. R. C. HAWSON, R.A.F.V.R., No. 684 Sqn.
F/O. O. A. DUPEE, D.F.M., R.A.F.V.R., No. 684 Sqn.
F/O. P. J. MCDONNELL, R.A.F., No. 684 Sqn.
P/O. J. GLOVER, R.A.F.V.R., No. 9 Sqn.
W/O. T. J. BASSETT, R.A.A.F., No. 576 Sqn.
P/O. D. N. BRITTON, D.F.M., R.A.F.V.R., No. 93 Sqn.
P/O. H. L. BRITTON, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. S. BURTON, R.A.F.V.R., No. 625 Sqn.
P/O. R. C. COVENY, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. R. J. GOOCH, R.A.F.V.R., No. 57 Sqn.
P/O. E. J. HOWES, R.A.F.V.R., No. 57 Sqn.
P/O. J. B. JOSLING, R.A.F.V.R., No. 57 Sqn.
P/O. F. J. KELLY, R.A.A.F., No. 101 Sqn.
P/O. A. R. KNOWLES, R.A.F.V.R., No. 57 Sqn.
P/O. F. NORCLIFFE, R.A.F.V.R., No. 57 Sqn.
P/O. N. M. PETERS, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
P/O. J. L. SCRAGG, R.A.F.V.R., No. 161 Sqn.
P/O. W. H. H. SIDDONS, R.A.F., No. 57 Sqn.
P/O. D. J. F. SYME, R.A.F.V.R., No. 101 Sqn.
P/O. S. G. TOWNSEND, R.A.A.F., No. 57 Sqn.
W/O. H. G. CARTER, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
W/O. H. F. CONNELY, D.F.M., R.A.A.F., No. 207 Sqn.
W/O. T. G. CUNNINGHAM, R.A.F.V.R., No. 625 Sqn.
W/O. J. GOULEVITCH, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
W/O. G. H. PORTER, R.C.A.F., No. 83 Sqn.
Act. W/O. W. PATTERSON, R.A.F.V.R., No. 166 Sqn.
Lt. Col. C. P. KOTZE, S.A.A.F., No. 21 (S.A.A.F.) Sqn.
Maj. E. M. BAKER, S.A.A.F., No. 5 (S.A.A.F.) Sqn.
Maj. A. L. STUART, S.A.A.F., No. 21 (S.A.A.F.) Sqn.
Act. Sqn. Ldr. P. W. RABONE, R.A.F., No. 23 Sqn.
Act. Sqn. Ldr. R. D. SHAW, R.A.A.F., No. 459 (R.A.A.F.) Sqn.
Act. Sqn. Ldr. P. V. K. TRIPE, R.A.F.O., No. 129 Sqn.
Flt. Lt. A. BREES, R.A.F.V.R., No. 268 Sqn.
Flt. Lt. D. E. FAIRBAIRN, R.A.A.F., No. 4 Sqn.
Flt. Lt. P. B. LAING-MEASON, R.A.F.V.R., N. 43 Sqn.
Flt. Lt. M. A. RICHARDSON, R.A.F.V.R., No. 167 Sqn.
Flt. Lt. C. T. P. STEPHENSON, R.A.F., No. 4 Sqn.
Capt. J. VAN-NUS, S.A.A.F., No. 1 (S.A.A.F.) Sqn.
Act. Flt. Lt. P. D. THOMSON, D.F.M., R.A.F.V.R., No. 458 (R.A.A.F) Sqn.
Act. Flt. Lt. R. W. TURKINGTON, R.A.F.V.R., No. 43 Sqn.

SERVICE AVIATION

F/O. G. W. ATTENBOROUGH, R.A.F.V.R., No. 107 Sqn.
F/O. T. H. CAMERON, R.C.A.F., No. 255 Sqn.
F/O. C. B. CARTER, D.F.M., R.A.F.V.R., No. 107 Sqn.
F/O. J. L. HOOD, R.A.F.V.R., No. 255 Sqn.
F/O. J. W. A. MCANULTY, R.A.F.V.R., No. 600 Sqn.
F/O. R. J. F. MITCHELL, R.A.F.V.R., No. 268 Sqn.
F/O. E. J. MILNE, R.A.F.V.R., No. 268 Sqn.
F/O. V. K. MOODY, R.C.A.F., No. 610 Sqn.
F/O. L. R. NEWTON, R.A.F.V.R., No. 40 Sqn.
F/O. D. C. WALCH, R.A.A.F., No. 180 Sqn.
P/O. N. D. HARRISON, R.N.Z.A.F., No. 1435 Sqn.
P/O. G. JAKIMOV, R.A.A.F., No. 500 Sqn.
P/O. J. L. WESTON, R.A.F.V.R., No. 21 Sqn.
Act. Flt. Lt. A. L. LAZENBY, R.A.F.V.R., No. 101 Sqn.
F/O. J. W. EINARSON, D.F.M., R.C.A.F., No. 61 Sqn.
F/O. A. W. PARRY, R.C.A.F., No. 10 Sqn.
F/O. L. H. BAVEYSTOCK, D.F.M., R.A.F.V.R., No. 201 Sqn
Wing Cdr. R. N. STIDOLPH, R.A.F.O., No. 61 Sqn.
Act. Sqn. Ldr. J. F. MARSHALL, A.F.C., R.A.F., No. 101 Sqn.
F/O. A. R. MACKENZIE, R.C.A.F., No. 421 (R.C.A.F.) Sqn.
Act. W/O W. L. EVANS, R.A.F.V.R., No. 101 Sqn.

ASTRAL NAVIGATION : W/O. Baldwin shooting the sun with a bubble sextant from the astro-dome of a Coastal Command Fortress based on the Azores.

Wing Cdr. B. D. RICHER, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
Act. Wing Cdr. W. CARTER, R.A.F.
Act. Wing Cdr. C. MCK. DUNNICLIFFE, R.A.F., No. 97 Sqn.
Act. Wing Cdr. P. N. JENNINGS, R.A.F.O., No. 207 Sqn.
Act. Wing Cdr. R. J. T. WAMLEY, R.A.F., No. 166 Sqn.
Sqn. Ldr. W. G. OLDBURY, R.A.F.O., No. 218 Sqn.
Act. Sqn. Ldr. D. P. D. ARCHER, D.F.M., R.A.F.V.R., No. 35 Sqn.
Act. Sqn. Ldr. R. F. EPPS, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. C. H. WILSON, R.A.F.V.R., No. 90 Sqn.
Flt. Lt. M. J. BAUD, R.A.A.F., No. 207 Sqn.
Flt. Lt. M. E. H. DAWSON, D.F.M., R.A.F.V.R., No. 196 Sqn.
Flt. Lt. J. F. GRIME, R.A.F.V.R., No. 207 Sqn.
Flt. Lt. D. K. MCKAY, R.C.A.F., No. 101 Sqn.
Flt. Lt. D. S. PATERSON, R.C.A.F., No. 630 Sqn.
Flt. Lt. T. W. ROBINSON, R.A.F.V.R., No. 105 Sqn.
Flt. Lt. P. S. F. WALMSLEY, R.A.F.V.R., No. 619 Sqn.
Act. Flt. Lt. W. D. AUSTIN, R.A.F.V.R., No. 101 Sqn.
Act. Flt. Lt. W. L. BAGG, R.A.F.V.R., No. 156 Sqn.
Act. Flt. Lt. H. J. BIDMEAD, R.A.F.V.R., No. 214 Sqn.
Act. Flt. Lt. G. W. S. BORTHWICK, R.A.F.V.R., No. 97 Sqn.
Act. Flt. Lt. S. C. BRAYSHAW, R.A.F.V.R., No. 90 Sqn.
Act. Flt. Lt. S. BURROWS, R.A.F., No. 44 Sqn.
Act. Flt. Lt. J. G. CLARIDGE, R.N.Z.A.F., No. 106 Sqn.
Act. Flt. Lt. R. J. H. CLAYTON, R.A.F.V.R., No. 7 Sqn.
Act. Flt. Lt. F. COWLING, R.A.F.V.R., No. 426 (R.C.A.F.) Sqn.
Act. Flt. Lt. R. V. CUTTS, R.A.F.V.R., No. 7 Sqn.
Act. Flt. Lt. S. R. DAWSON, D.F.M., R.A.F.V.R., No. 97 Sqn.

Distinguished Flying Medal

Flt. Sgt. A. E. BROOKES, R.A.F.V.R., No. 619 Sqn.—For citation see Flt. Lt. Tomlin, D.F.C. and Bar.
Sgt. P. DAVISON, R.A.F.V.R., No. 77 Sqn.
Sgt. M. TARPEY, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. W. J. T. GRANFIELD, R.A.F.V.R., No. 166 Sqn.
Sgt. R. A. KEMP, R.A.F.V.R., No. 166 Sqn.
Flt. Sgt. W. G. OSMOTHERLY, R.A.A.F., No. 101 Sqn.
Flt. Sgt. J. R. POLLOCK, R.C.A.F., No. 50 Sqn.
Flt. Sgt. R. W. RUSH, R.A.F.V.R., No. 625 Sqn.
Flt. Sgt. G. H. H. RUSSELL, R.A.F.V.R., No. 12 Sqn.
Flt. Sgt. S. G. WEBSTER, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Flt. Sgt. A. WILKES, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. A. WRIGHT, R.A.F.V.R., No. 83 Sqn.
Sgt. F. ARTHUR, R.A.F.V.R., No. 166 Sqn.
Sgt. J. CLARK, R.A.F.V.R., No. 10 Sqn.
Sgt. D. DOE, R.A.F., No. 83 Sqn.
Sgt. T. GEDLING, R.A.F.V.R., No. 207 Sqn.
Sgt. S. P. GEORGE, R.A.F., No. 12 Sqn.
Sgt. D. J. GRIFFITHS, R.A.F., No. 57 Sqn.
Sgt. J. HENDERSON, R.A.F.V.R., No. 77 Sqn.
Sgt. F. E. HILL, R.A.F.V.R., No. 625 Sqn.
Sgt. C. MCKINNON, R.A.F.V.R., No. 158 Sqn.
Sgt. L. MOONEY, R.A.F., No. 101 Sqn.
Sgt. W. L. PORCHER, R.A.F.V.R., No. 625 Sqn.
Sgt. G. A. D. RICHARDS, R.A.F.V.R., No. 10 Sqn.
Sgt. T. D. SHARLEY, R.A.F.V.R., No. 10 Sqn.
Sgt. L. UNWIN, R.A.F.V.R., No. 44 Sqn.
Flt. Sgt. A. DIVERS, R.N.Z.A.F., No. 283 Sqn.
Flt. Sgt. H. C. GRUNDEY, R.A.F.V.R., No. 70 Sqn.
Flt. Sgt. E. J. HOLMES, R.A.F.V.R., No. 284 Sqn.
Flt. Sgt. R. E. STOWERS, R.N.Z.A.F., No. 70 Sqn.
Sgt. J. R. MILSON, R.A.F.V.R., No. 70 Sqn.
Flt. Sgt. C. L. BOX, R.A.F.V.R., No. 166 Sqn.
Sgt. E. STEVENSON, R.A.F.V.R., No. 166 Sqn.
Flt. Sgt. P. W. DENNIS, No. 432 (R.C.A.F.) Sqn.
Flt. Sgt. E. L. HOWARD, R.A.F. No. 44 Sqn.
Sgt. J. H. LEON-QUESNEL, No. 432 (R.C.A.F.) Sqn.
Sgt. J. L. DUFFY, R.A.F.V.R., No. 77 Sqn.
Sgt. T. KING, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. J. LAURENS, R.A.F., No. 101 Sqn.
Sgt. L. R. LUFFMAN, R.A.F.V.R., No. 101 Sqn.
Flt. Sgt. S. C. BASHFORD, R.A.F.V.R., No. 100 Sqn.
Flt. Sgt. J. W. BOYNTON, R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. G. H. BROADHEAD, R.A.F., No. 207 Sqn.
Flt. Sgt. L. R. CLARK, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. W. CRUIKSHANK, R.A.F.V.R., No. 626 Sqn.

Roll of Honour

Casualty Communiqué No. 350.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 111 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. J. Beever; Sgt. J. H. Caldwell; Sgt. R. G. Cleeve; Sgt. G. G. Critchley; Sgt. E. W. Crouch; Sgt. S. V. Cull; Sgt. G. C. Draycott; Flt. Sgt. P. M. C. Ellis; Sgt. H. A. Hadlow; P/O. P. I. Hickes; Flt. Sgt. E. G. Hubbard; Flt. Sgt. J. Killen; F/O. J. Kirkwood; Sgt. J. McKenzie; Sgt. L. Madeley; Flt. Lt. A. D. M. Nash; F/O. E. J. Plas; Sgt. C. E. Reeve; Sgt. J. W. Ross; Sgt. R. C. Stewart; Sgt. S. A. Taylor; Flt. Sgt. W. H. Watkins; Sgt. J. A. Watson; F/O. G. A. Wigley.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. B. D. Bridge; Sgt. B. J. Thompson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. H. W. Barnett; Sgt. S. Braybrook; Sgt. J. Bryant; Sgt. J. Boyd; F/O. P. S. Burgess; F/O. R. H. Capron; Sgt. W. Davis; Sgt. J. M. Donald; Sgt. J. Douglas; Act. Flt. Lt. G. H. T. Eades; Sgt. G. H. Edwards; Sgt. V. N. Elkins; P/O. A. Gillespie; Sgt. A. Haddow; Sgt. N. F. Hallett; Sgt. G. R. Harbottle; Sgt. W. H. Hargreaves; Sgt. R. W. Harley; Sgt. W. T. Hurl; Sgt. J. C. Insole; Sgt. W. T. Leathley; Sgt. J. R. G. Liddell; Sgt. J. McAllister; F/O. R. Marriott; F/O. A. B. Marsh; Sgt. S. Moseley; Sgt. T. Peat; Flt. Lt. M. H. A. Phillips; Sgt. D. A. Pitman; Sgt. P. Plowright; Sgt. J. Pomfret; P/O. A. L. S. Portch; Flt. Lt. A. S. W. Prioleau; Sgt. J. A. Proctor; Sgt. E. A. Raby; P/O. A. W. Richmond; Sgt. R. P. T. Saunders; Sgt. G. A. Sherwood; F/O. J. N.

SERVICE AVIATION

Shirley; F/O. B. J. Smith; Sgt. G. H. Smith; Sgt. L. G. Smith, Sgt. S. E. Spicer; F/O J. A. G. Thomson; F/O. C. Thwaites; Flt. Sgt. J. H. Tolkin; Sgt. H. A. Upton; Sqn. Ldr S. N. T. Wallage; F/O. S. H. Walpole; P/O. F. E. F. Weldon; F/O D. W. Wheeler; P/O S. L. Whillis; Sgt. A. J. White; Sgt. N. H. Williams; Sgt. V. R. Wilson; Sgt. A. R. Wood.

MISSING, BELIEVED KILLED IN ACTION.—W/O M. G. Clynes; Sgt. P. Crosland; Sgt. D. H. W. Little.

MISSING.—Sgt. P. W. Alderton; Sgt. J. H. Ashcroft; Sgt. L. H. Barnes; Sgt. J. L. Barrett; Sgt. D. Blue; Sgt. W. C. Buzan; Sgt. W. H. Chambers; Flt. Sgt. C. Chapman; Flt. Sgt. C. P. Chesters; Sgt. F. F. Clarke; Sgt. R. C. Clifford; Sgt. C. Coe; Flt. Lt. F. G. T. Collins; Flt. Sgt. J. Coulton; Flt. Sgt. D. W. Croker; Act. Wing Cdr. D. M. Crossley, D.F.C.; Sgt. C. Cushing; P/O R. D. Darling; Flt. Sgt. D. H. Davies; Flt. Sgt. W. Docherty; F/O. G. Drake; Sgt. D. I. J. Evans; Sgt. H. Feeney; Sgt. A. E. Ford; Sgt. C. Frankish; Flt. Sgt. E. G. Grundy; Sgt. R. E. Hackett; Sgt. W. B. Hamilton; Flt. Sgt. M. Hartley; P/O. S. Heald; Sgt. R. W. Hodgson; Sgt. W. G. Holme; Flt. Sgt. R. Holmes; Sgt. F. W. Kite; Sgt. E. H. Lloyd; F/O. R. S. McAra; Sgt. D. McGrath; Sgt. M. J. Martin; Sgt. J. Mathewson; P/O. G. S. Milner; Sgt. T. W. Moore; Sgt. D. J. Morley; P/O. J. Morton; Sgt. G. North; Sgt. H. S. Oldfield; Sgt. C. O'Neill; Flt. Sgt. G. Owen; Flt. Sgt. K. J. Page; F/O. P. W. R. Pollett; Sgt. L. G. Pullen; F/O. D. J. O. Pyne; P/O. D. F. Rands; Sgt. E. Russom; F/O. J. M. T. Sanctuary; Sgt. J. Shelton; Sgt. E. S. Siddall; P/O. G. Smith; Sgt. H. Smith; Sgt. E. Speirs; P/O. C. H. Storer; Sgt. F. R. M. Squair; Flt. Sgt. D. A. A. Swain; Sgt. N. D. Taylor; P/O. S. J. Troake; Sgt. B. F. Tutt; Flt. Sgt. R. S. Vincent; Sgt. E. Vine; Flt. Lt. R. F. G. Wakeling; P/O. T. Watson; Sgt. R. R. Webb; Sgt. P. I. Weeks; Flt. Sgt. A. J. Wickersham; Sgt. J. G. Wiggins; Act. Wing Cdr. E. N. Woods, D.F.C.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. W. E. Bowen; Sgt. W. Bridges; Sgt. L. Limbrick; Sgt. G. Lindon.

KILLED ON ACTIVE SERVICE.—P/O. A. F. Beckett; F/O. W. R. Coggins; Sgt. P. Coopman; A/C.2 J. Dennahy; Flt. Lt. G. Fisher; Sgt. D. H. Hall; L.A/C. A. S. Lovett; F/O. H. L. Mosselmans; F/O. E. St. J. B. O'Callaghan; P/O. A. G. Simpson; Sgt. R. Welsby.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. S. Bell; F/O. F. C. Elisha; A/C.2 K. R. James; Sgt. B. Kelly; L.A/C. H. S. Phillips; Sgt. G. Preston; Sgt. H. G. Sutton; Flt. Sgt. A. W. C. Yeates.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. H. W. V. Buckler; Sgt. C. Drake.

DIED ON ACTIVE SERVICE.—L.A/C. J. Atkins; L.A/C. J. H. Donovan; L.A/C. R. G. H. Hutchings; Sgt. H. R. Jefferies; W/O. M. R. Johnstone; A/C.2 A. Kershaw; Cpl. F. Lambert; L.A/C. W. Lawrie; F/O. A. G. Mainwaring-Ellerker-Onslow; A/C.1 A. Moore; A/C.1 S. S. Neil; Act. Flt. Lt. F. C. Smith; A/C.1 G. A. J. Stapleford.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. A. C. Langdon.

Royal Australian Air Force

KILLED IN ACTION.—F/O. H. G. D. Dedman; Flt. Sgt. R. T. A. Freeman; Flt. Sgt. W. K. Halstead; Flt. Sgt. C. G. Howie; Sgt. R. A. Moynagh; Flt. Sgt. L. J. Muschialli; Flt. Sgt. H. H. Petersen; F/O. F. A. Randall, D.F.C.; Flt. Sgt. G. K. Reid; Flt. Sgt. J. Richards; Sgt. R. J. Richardson; Flt. Sgt. F. R. Scott; Flt. Sgt. B. P. Wicks.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. F. Allsopp; Flt. Lt. R. N. G. Barlow; Flt. Sgt. J. L. Barry; Flt. Sgt. E. J. Candish; Flt. Sgt. S. N. Curtiss; Flt. Sgt. J. H. Dodgshun; F/O. K. Girrbach; F/O. J. R. Henderson; Flt. Sgt. A. Hilton; Flt. Sgt. D. N. Jackel; Flt. Sgt. E. E. Lancaster; Sgt. A. K. Meadows; F/O. N. J. Ritchie; P/O. I. R. Robertson; F/O. S. M. Russ; F/O. C. R. Williams; Flt. Sgt. W. Williams.

WOUNDED OR INJURED IN ACTION.—P/O. A. Lange.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. C. R. Frizzell.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. R. W. Sinden.

MISSING.—F/O. G. L. Blackmore; Flt. Sgt. J. A. Buckman; Flt. Sgt. H. Campbell; Sgt. D. J. Conroy; Flt. Sgt. I. L. Fraser; Flt. Sgt. G. G. Gillett; F/O. S. J. Hansen; Flt. Sgt. A. A. Harris; P/O. H. W. Harris; P/O. J. G. McAlpine; Flt Sgt. J. R. MacLeod; Sgt. J. F. Madden; P/O. V. A. Martin; Flt. Sgt. F. E. Nowland; W/O. A. J. Painting; F/O. E. A. Richardson; W/O. T. B. Sheekey; Flt. Sgt. C. G. Underwood; Flt. Sgt. M. G. Western.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. N. R. Munday.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. H. H. Skeels-Piggins.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. C. H. McK. Daniell.

DIED ON ACTIVE SERVICE.—P/O. F. C. McCrae.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. W. M. Currie, Sgt. J. W. Halikowski; P/O. C. Murray.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. Cachia; Sgt. E. D. Coates; P/O. G. E. Cronk; Sgt. L. V. Johnston; Flt. Sgt. L. P. McClive; F/O. J. G. MacKay; P/O. C. L. Maunder; P/O. H. F. Perrot; F/O. J. G. J. Prideaux; P/O. J. D. J. Rodger; P/O. H. J. Ross; Sgt. C. H. Smith; Sgt. D. S. Urquhart; Sgt. J. V. Welsh.

MISSING BELIEVED KILLED IN ACTION.—Flt. Sgt. J. G. Bennett.

MISSING.—F/O. H. C. Aley; Flt. Sgt. P. J. Barske; Act. Flt. Lt. C. M. Brown; W/O. C. F. Cameron; W/O. P. R. Carpenter; Flt. Sgt. H. Dubnick; F/O. H. W. Fitch; Sgt. A. M. Grimson; Flt. Sgt. M. J. Kennedy; Sgt. J. G. E. Laflamme; Sgt. G. B. Mould; Flt. Sgt. R. S. Orr; P/O. G. H. Rich; F/O. J. A. Robertson; F/O. D. R. P. Short; Flt. Sgt. B. H. Varey; Act. Flt. Lt. C. H. Wheatley.

KILLED ON ACTIVE SERVICE.—P/O. A. R. McIntyre.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. J. Basistnik; Sgt. F. A. De Beck; P/O. J. Zinkhan.

DIED ON ACTIVE SERVICE.—Flt. Sgt. A. K. Pearson; Sgt. W. S. H. West.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. B. O. Anderson; Flt. Sgt. R. C. Brooks; Flt. Sgt. L. I. Dunbar.

SEEING INTO THINGS: An officer of an Army Air Photographic Unit with the 8th Army studying air photographs of enemy positions.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. C. T. Cobb; F/O. F. L. M. Whibley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. R. F. Elliott; Sgt. R. T. Eria; Act. Flt. Lt. L. McLachlan; Sgt. P. G. Nelson; Sgt. G. A. Taylor.

MISSING.—Wing. Cdr. T. O. Freeman, D.S.O., D.F.C.; Act. Flt. Lt. R. J. Taaffe.

South African Air Force

KILLED IN ACTION.—Maj. A. E. Hulse; Lt. D. Kriseman; Lt. V. W. Offer; 2/Lt. S. M. Upton.

KILLED ON ACTIVE SERVICE.—2/Lt. L. F. Chidell; Capt. B. P. Dillon.

Casualty Communiqué No. 351

Of the names in this list 111 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. H. L. Blackwell; Sgt. T. E. Cain; Sgt. J. W. Christmas; Sgt. C. W. Collishaw; Sgt. F. S. Copping; Sgt. H. L. Cornwell; Sgt. W. Corrigan; Sgt. T. L'A. Dee; Sgt. G. C. Denman; Flt. Sgt. P. A. Fry; Sgt. F. A. Furrie; Sgt. R. M. J. Gaffney; Act. Flt. Lt. S. N. Gray; Sgt. J. Greenwell; Sgt. G. Grundy; Sgt. E. Halliwell; F/O. W. Hamilton; W/O. W. H. Harris; Sgt. H. G. A. Hine; Sgt. J. R. Hoddinott; F/O. C. R. Jaques; Sgt. A. H. Johnson; Flt. Sgt. A. J. Kevis; Sgt. R. D. King; Sgt. R. A. Lawrence; P/O. R. P. Marks; Sgt. H. E. Miles; Flt. Sgt. S. F. Miller; Sgt. G. Osborne; Sgt. S. G. Parrott; Sgt. S. J. Peck; Sgt. C. W. Plampton; Sgt. J. Powell; Sgt. R. G. Read; Sgt. I. A. Redman; Flt. Sgt. V. Richter; F/O. J. D. E. Robertson; Sgt. T. Rudden; Sgt. L. Sale; F/O. F. Thackway; F/O. L. H. Thomas; P/O. R. A. Van Walwyk, D.F.M.; Sgt. D. S. Watson; Flt. Sgt. J. G. A. Watson; Sgt. K. R. Wood.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. G. G. Ambler; Sgt. L. E. Jones; Sgt. E. W. Lord; P/O. J. N. McSwiney; Sgt. T. Pennock; Sgt. E. B. Smith; Sgt. R. Smith; F/O N. Snowdon; Sgt. J. C. W. Thomson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. D. Balfour; Sgt. R. R. Barnes; F/O. K. S. Bird; Sgt. R. B. C. Bloom; Sgt. T. Boland; Sgt. A. L. Bond; Sgt. R. G. Boustead; P/O. R. Brown; F/O. H. F. Clements; Sgt. J. J. Courtney; P/O. H. B. Currall; F/O. M. Donaldson; Sgt. J. G. Duncan; Sgt K. Evans; Sgt. G. R. Fernee; Act. Sqn. Ldr M. Foulis, D.F.C.; Flt. Sgt. F. Hay; F/O. J. W. Holloway; Act. Flt. Lt. E. C. Lee Brown; Sgt. H. W. Little; Sgt. W. Magee; F/O. J. R. March; Sgt. H. J. Martin; Sgt. W. M. Meiklejohn; Sgt. H. W. Moore; Sgt. F. A. Moulton; Sgt. M. McK. Muirhead; Flt. Sgt. W. A. Owens; Sgt. L. W. Rees; Sgt. R. W. Robinson; Sgt. H. D. Rowe; F/O. W. F. C. Rushton; Sgt. P. R. Rutter; Sgt R. E. Smith; Sgt. F. A. Solly; Sgt. J. Speirs; Sgt F. Spencer; Sgt. R. A. Storey; Sgt. R. H. Tayler; Sqn. Ldr. J. A. Tinne; P/O. A. F. Towers; F/O. G. F. J. Waite; Sgt. J. H. Whitehart; P/O. R. E. Wilkes; P/O. A. L. Worsley; F/O. J. C. Yates; Sgt. L. J. Yeo.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. C. H. Hawkins; Sgt. P. H. Mack; W/O. N. Pickles; Sgt D. E. Stewart.

MISSING BELIEVED KILLED IN ACTION.—P/O. A. P. E. Strange.

MISSING.—P/O. G. E. Adams; Sgt. R. Atkin; W/O. D. Baker; Flt. Sgt. L. W. Ball; P/O. G. W. F. Batchelor; Sgt J. C. Blackmore; Flt. Lt. D. J. Brill; Act. Wing Cdr. P. R. Burton-Gyles, D.S.O., D.F.C.; F/O. R. Butler; F/O. D. H. Calman; Sgt. H. Chappell; Sgt B. Chew; P/O. C. J. B. Cogdell; P/O. W. H. Craig; Sgt. J. H. J. Darvall; F/O. W. H. Davies; Sgt. D. O. Dempster; Sgt. B. R. Finney; Flt. Sgt. W. S. Fisher; Act. Sqn. Ldr. R. Hadley; Act. Flt Lt. R. E. Handley, D.F.M.; Flt. Sgt. L. J. G. Harmel; Sgt. J. Hendry; Sgt. T. J. Jackson; Flt. Sgt G. E. Mason; P/O. T. B. Melia; P/O A. T. Moodie; Flt. Sgt. J. N. Redfern; Sgt. C. Robinson; P/O. D. A. Rollin; P/O. H. H. Sherer; Sgt. G. F. Simpkin; Sgt. E. Smith; Act. Flt. Lt. V. Smith, D.F.C.; Sgt. R. Standing; Sgt. J. Stone; Flt. Sgt. S. G. Thomas; Flt. Sgt. E. J. Tocher; Flt. Sgt. F. R. Tuxill; Sgt. J. T. Walkinshaw; Sgt. K. Watmough.

KILLED ON ACTIVE SERVICE.—Sgt. W. S. Austin; Flt. Sgt. R. R. Burgess; L.A/C. W. V. Collins; Sgt. L. R. Cox; Sgt. C. H. Drakeford; F/O. L. Fletcher, Flt. Sgt. D. C. Grant; Flt. Sgt. K. C. Hampson; Sgt. E. Harris; Sgt. J. F. Hughes; F/O. L. V. Jones; Flt. Sgt. G. W. Jubb; Sgt. L. B. Lawrance; Sgt. F. Nichols; Sgt. J. Pennington; Sgt. H. Poole; Flt. Sgt. C. Russell; Sgt. R. T. Stoneman; Sgt. R. H. Woolcock.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. S. Parsons.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—L.A/C. E. P. Ragster.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. F. W. East; Sgt. C. R. G. Robbins; Sgt H. A. S. Russell; Sgt. C. Wilkins.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. J. B. Bendall; Sgt. P. Dillon.

DIED ON ACTIVE SERVICE.—L.A/C. W. J. Cox; A/C.1 E. Dingley; L.A/C. L. V. Grieveson; L.A/C. S. R. Jeffery; A/C.1 A. Litchfield; L.A/C. J. O. Shedden; A/C.1 W. D. Thomas; Cpl. A. G. Wood.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. G. R. Darvill.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. K. E. Foxcroft; Flt. Sgt. T. L. R. Kay; Flt. Sgt. V. Meinhert; Flt. Sgt. J. H. Murphy; Flt. Sgt. L. McD. Scott.

MISSING, BELIEVED KILLED IN ACTION.—Flt Sgt. P. J. Edwards.

MISSING.—P/O. R. C. K. Anderson; Act. Flt. Lt. C. O. Aubert; Flt. Sgt. E. J. Battle; Flt Sgt. S. G. Berry; W/O. R. R. Donaldson; W/O. W. L. C. Hickling, D.F.C.; Flt. Sgt. G. H. Kloske; Act. W/O. C. W. Knox; P/O. E. J. Layh; Act. Flt. Lt. G. B. Loder; P/O. N. G. McIntyre; Sqn. Ldr. N. T. B. Poulton; Act. Flt. Lt. L. J. Powell; P/O. E. W. Ritchie, D.F.C.; Act. Flt. Lt. J. F. Samuel, D.F.C.; F/O. R. S. Smith; P/O. D. Todhunter; Flt. Sgt. W. G. Ward; Act. Flt. Lt. R. H. Wedd.

KILLED ON ACTIVE SERVICE.—Sgt. D. E. Leseberg; Sgt. K. F. Wightman.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. W. W. J. Allen; Flt Sgt. J. R. Bateman; Sgt. H. R. Bessent; Flt. Sgt J. O. E. J. Boily; F/O. C. M. Collier; F/O. K. J. Cox; F/O. A. J. Davies; W/O. W. L. Dobson.

SERVICE AVIATION

Sgt N M. Gillis; F/O L. K. A. Grant; Flt Sgt. B. W. Haney; Sgt. C. L. Hope; Flt. Sgt D. R. Irvine; P/O. A. A. Johnston; P/O. G MacD. Jones; Act. Sqn. Ldr. T. M. Kneale; F/O J. MacKay; F/O. M. E. Marynowski; F/O. H. F Morris; P/O. M. M. Prill; Sgt. M. F. V. Roobroeck; Flt. Sgt. H. M. Saunders; Flt. Sgt G. R Schneider; F/O. W. F. Sheppard; F/O. D. H Stamers; Flt. Sgt. R. D Stewart; Sgt G. L Strang; Sgt. L. Wilton.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. F. R. W. Anderson; Sgt. A. L. Bateman; Sgt. C. N. Beaton; Sgt. W. McM. Bissett; Sgt. C. A. Boyd; Flt Lt. C. A. Brennan; Flt. Sgt. J. A. Buick; P/O R. B. Carlson; Sgt. E. R. Carvajal; P/O. H. M Champion; P/O G. Cojocar; F/O. R. G. Cook; Sgt. C. L. Copping; Sgt. C. W. Dahl; F/O. G. W. Elliott; Sgt. J. H. M. Fraser; F/O. J. E. Hardy; Sgt. W. D. Heslip; P/O. W. G. Hoar; Flt Sgt H. L. Huether; F/O. A. H. Jackson; Sgt. J. A Kilpatrick; F/O E. Kitt; Sgt. M. A. Lambert; Sgt. R. C. Legge; Sgt. E. J. Longstaff; Sgt. D. F. McFadden; Sgt. F. G. McGrath; F/O. R. G McLean; Sgt. R. G. Montgomery; W/O. H. E Nesbitt; Sgt. A. H. Penner; F/O E. R. Ray; Sgt. D. L. Robertson; Sgt. K. W. Rosevear; F/O. G. A. Smith; Sgt. F. C. Stewart; Sgt. R. B. Stover; P/O. F. S. Strouts; F/O. H. E. Tanner; P/O. L. R. Townsend; P/O J. J. H. Turnbull; F/O. L. G. Vallance; Sgt. G. Walen; Sgt. D. J. K. Wallace; F/O. R. J. Weatherhead; Flt. Sgt. G. K. Young; F/O. W. C. Zapfe.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. W. C. Allan; F/O R. E. Harman; Flt Sgt. P Perchinski; Flt. Sgt. L. J. Yeo.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. B. A. McLennan; P/O F. C. MacQueen; Sgt. C. B. Wallace.

MISSING, BELIEVED KILLED IN ACTION.—P/O H. J. Hurley; W/O. J. D. Newcombe.

MISSING.—F/O. G. R. Adams; P/O. L. P. Archibald; Act. Flt. Lt. W. D. Crimmins, D.F.C.; Flt Sgt. D. Finlayson; W/O. W. D. Kearney; P/O J. L. R. R. Lachance; P/O. G. J. Little; P/O N. B. Morrison; W/O. G. L. Ready; F/O. J. A. Stephens; W/O. J B. Toombs; Flt. Lt T. Trilsbeck, D.F.C.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. W. Baldwin; P/O A. R. Cameron; F/O. W. H. Eager, D.F.C.; Sgt. J. Foote; Sgt. H. P. Mitchell; W/O. J. A. Pierson; Sgt B. N. Redmond; Sgt. H. M. Tait.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. J. G Dukick

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J H. R. Carey; Flt. Sgt. N. A. MacLeod.

MISSING.—Act Flt. Lt M. A Sullivan, D.F.C.

South African Air Force

DIED ON ACTIVE SERVICE.—Lt. W. A M. Donald.

Casualty Communiqué No. 352

Of the names in this list, 113 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. H. D. G. Aldiss; Sgt. R. Askew; Sgt. A. T. Broome; P/O. J. T. Brown; Sgt F. G. Clark; Sqn. Ldr. E. A. Deverill, D.F.C., D.F.M.; Flt. Sgt. F. R. Farr; Sgt. J. E. Grozier; Flt. Lt. G. R. Halbeard; F/O. W. C. Henderson, D.F.C.; Act. Wing Cdr. D. W. Holford, D.S.O., D.F.C.; Flt. Lt. R. P. Johnson; P/O. R. E. Mason; W/O. D. J. Penfold; Flt Sgt. A. Russell; Sgt. W. A. Savage; Flt. Lt. A Walker; Sgt. J. A. Warner; Flt. Sgt. H. Whybrow; Sgt. J. Wunderley.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. F. Austin; Sgt. H. N. Bateman; Sgt. P. R. J. Blake; Sgt. B. R. Cripps; Sgt. C. W. Dudley; Sgt. K. S. Hobkirk; Sgt. E. W. H Johnson; P/O. C. S. Olson; F/O. N. C. Taylor; Sgt. G. C. Whittaker.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. F. T. Adams; Sgt. L. R. Akehurst; F/O. A. D. A Barnes; Sgt. C. A. S. Barnett; Sgt. F. V. Bayford; P/O. A. D. Bebbington, M.M.; F/O D. G. Bentham; Sgt. W. S. Bragg; Sgt. E. G. Brown; Flt. Sgt T. C. Bullock; P/O H. J. Clelland; Sgt. G. S Cole; Sgt. J. C. F Cook; Flt. Sgt. S. T Cox; Sgt. R. E. Crook; Sgt. J. W. Deacon; Sgt. R. N Dixon; Sgt. W. J. Drayton; Sgt. R. H. Dunstan; Sgt. N. L. Fairhurst; Sgt. G. W. G Fletcher; Act. Flt. Lt. R. I. Fraser; Act. Wing Cdr J. H. Gleed, D.S.O., D.F.C.; Sgt. H Goddard; Sgt. C. E. Grimshaw; Sgt. A. J. Gurr; Sgt. J. Hall; Sgt. J. P Harper; Sgt. E. A. Higham; Sgt. H. D. Houghton; Sgt. J. T Hounsell; Sgt. E. V. Hudson; P/O F. R Johnson; Flt. Sgt. N. E. Jones; Sgt. J. E. S. Kimber; Sgt. F. G. Lambert; Act. Flt. Lt. E. A. J. Laver; Sgt. M. Leonard; Sgt. P. Lutwyche; Sgt. F. H. McConville; F/O. C. N. Millward; Sgt. H. Munnery; P/O. J. North; Sgt. D. J. Park; Flt Sgt. J. S. Patman; P/O. E. J. Plumridge; Sgt. A. E. Prain; Sgt. K.Ray; Sgt. J. H. Reynolds; Sgt. H. R. Rhodes; Sgt. P. C. W. Rich; P/O. W. S. Smith; Sgt. L. S. Staight; Sgt. J. C. W. Stevens; Sgt. J. W. Stotter; Sgt. D. Stowe; Sgt. W. N. Underwood; Sgt. J. J. Veldsman; Flt. Sgt. F. M. Venn; Sgt. L. Williams; F/O. K. D. Williams; Sgt.; N. H. Wood; Flt. Sgt. C. Woodall.

WOUNDED OR INJURED IN ACTION.—W/O. J. Benbow; Sgt. L. Budd; P/O. E. O. Mackay.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. J. J. Hannah; Sgt. T. B. Hawkes; Sgt. R. Marshall; Sgt. R. A. Whitley.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. N. E. Adams; Sgt. A. E. Baumann; P/O. I. C. B. Black; F/O F. J. Blake; Sgt. G. B. Bradley; Flt. Sgt. G. Brothers; F/O. R. Burrell; Sgt. E. L. Button; P/O. K. T. Dale; Sgt. W. D. R. Davies; F/O. J. H. Ferguson; Sgt. D. T. Gordon; Sgt. D. S. Hall; Sgt. J. Henderson; Flt. Sgt. K. A. Humphries; Act. Wing Cdr. E. Pullen; Sgt. H. P Thomas; Sgt. F. J. A. Tuppen.

MISSING.—Sgt. L. P. E. Allais; Sgt L. Balich; Sgt. F. Ball; Sgt. J. L. Barrington; P/O. R. A. Bayldon; F/O. D. V. F. Bennett; Sgt. S. A. Berry; Flt. Sgt. J. T. S. Boddington; W/O. B. Bolsworth; Sgt. W. Borthwick; Flt. Sgt A. W. Bouchier; Act. Flt. Lt. A. R. Burchett; Sgt. H. Campbell; Sgt. G. M. Coggans; Sgt. F. S. Cope; W/O. V. C. Cordery, M.M.; Flt. Sgt C. H. W. Cotterell; Sgt. W. Dickie; Sgt. E. W. Dickman; Sgt. J. W. Diwell; F/O A. J Carey; Flt. Sgt. F. Edwards; Sgt. E. Egan; Sgt. F. M. Gage; Act. Sqn. Ldr. J. M Garlick, D.F.C.; Sgt. W. M. Gray; Sgt. G. Hampton; Wing Cdr. C. D Hancock, O.B.E., D.F.C.; Sgt L. A Henson; Flt. Sgt. L. Heward; Sgt. A. F. Hughes; P/O. D. A. Hyne; F/O. G. S Jones; Sgt. E. Kent; Sgt. J. Lynch; Sgt. G. L. Martin; Flt. Lt. W. W Maxfield; Sgt G. D. Milne; P/O. H. St. C. H. Moodie; Sgt. D G. Morris; P/O J. B. O'Brien; Sgt. A. C. Orme; F/O. B. Otter; Sgt. T Paling; P/O G. E. Pleasance; Sgt. A. J. Pollitt; Flt. Sgt. K. B. Renelt; Sgt. A. Richardson; Sgt. J. M. H. Rochecouste; Sgt. G. C. Sage; Sgt. B. Smith; Sgt. M. J. Smith; Sgt. A. H. Steel; Sgt. F. Tessick; Flt. Sgt. J. W. Thompson; P/O. A. G. Thorne; Sgt. C. C. Toms; Sgt. E. C. Toms; Sgt. W. H. Veale; Sgt. F. A. Viner; Flt. Sgt. D. O. Vize; F/O P. A. Watts; Sgt. J. K. Widdop; F/O. T. I. Widdowson; Flt. Sgt. D. Williams; Flt. Sgt. S. E. Woolf.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. K Dunkerley.

KILLED ON ACTIVE SERVICE.—Sgt. F H. Adams; A/C.2 J. A. G. Box; Sgt. W. M. Bridge; P/O C. H. Brown; Sgt. H. G. Buxton; F/O C. H. Campbell; A/C.2 C. F. Davies; F/O. K. J. F. Funnell; F/O P. S. Gumbrell; Sgt. K. R. Halliday; Sgt. S. Higham; F/O. T. W. W Hodgson; Sgt. H. M. Houghton; L.A/C. A. F. James; F/O. D. Kelley; Sgt C. A. Kidd; Sgt. A. J. McIntyre; Flt. Sgt J. R. McMillan; W/O. W. M. F. Moffatt; F/O. F. G. Mogg; Sgt. J. E. Mooney; P/O. J. E. Peez; Sgt. E. R. Phillips; Sgt. J. N. Polland; Flt. Sgt. A. B. Shaw; Sgt. R. Summers; L.A/C. J. T. Taberner; Sgt. H. G. Williams; P/O. C. A. Wooldridge; Sgt. D. H. Wright.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. P. G. Scotter; Act. Sqn. Ldr C. W. P. Selby.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. C. J. Bicknell; Sgt J. G Reed; P/O. J. W. Swaby.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. T. Fairle; P/O. A. J. Greatrex.

DIED ON ACTIVE SERVICE.—F/O. B. R. Clover; L.A/C D. A. Evans; Cpl R W M. Francis; Cpl. F. J. Gilbert; W/O. H. Hutchins; Cpl. K D Mole; L.A/C. C. H Monk; A/C.1 L. F. Oliver; L.A/C. C. A. Sowter; A/C.2 R. J. Trevethan.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. A. V. Kyle.

OLD FAITHFUL: A Desert Air Force Baltimore, U for Uncle, which has been retired after 102 ops. and 313½ flying hours.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. A. H. Dick.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. R. H. Emmerson; Flt. Sgt. H. R. McDowell; Flt. Sgt. H. R. H. Ress.

WOUNDED OR INJURED IN ACTION.—P/O. C. E. D. Bolingbroke.

MISSING, BELIEVED KILLED IN ACTION.—P/O. J. L. Heckendorf; Flt. Sgt. R. C. Turner.

MISSING.—W/O. C. W. Crawley; Flt. Sgt. D. C. Grant; Flt. Sgt. J. F. Moore; Flt. Sgt. R. Wilkinson; Flt. Sgt. R. I. Wynne.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. P. O'Donnell.

KILLED ON ACTIVE SERVICE.—P/O. H. W Boyd; Flt. Sgt. N. C. Ross; Flt. Sgt. K. C. Scott; Sgt. E. W. J. Semmens; Sgt. J. E. Thomas.

Royal Canadian Air Force

KILLED IN ACTION.—P/O. H. B. Wareham.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. Burns; Sgt. H. Clement; F/O. H. R. Drake; F/O. A. B. Foster; Sgt. J. McL. Harrison; Sgt. R. McL. Hicks; P/O. A. E. Kelly; P/O. L. A. Stinson; Sgt. A. R. Warnick.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. A. Anderson; P/O. F. G. Baker; Flt. Sgt. J. P. Bishop; Sgt. R. B. Blake, P/O G. R. Densmore; W/O. W. E. Douglas; Flt. Sgt. S. E. Eversfield; P/O. M. R. Felsen; Sgt. K. F. Fighter; F/O. D. B. Henderson; Flt. Sgt J. R. Keeping; Flt. Sgt. A. L. Keith; Sgt. G. A. Leitch; P/O. J. H. T. J. Lemieux; Flt. Sgt. L. E. McGee; F/O. G. McMillan; P/O. R. G. Madge; Sgt. W. MacK. Manson; Sgt. D. C Maxwell; P/O. W. G. Monk; F/O. S. L. Murrell, D.F.C.; Flt. Sgt. G. A. Nelson; Sgt. W. G. Pepper, Flt. Lt. F. A. Reynolds; Flt. Sgt. R. L Robinson; P/O. E. D. Rowe; P/O. W. B. Taylor; Flt. Sgt. N. J. Waters.

WOUNDED OR INJURED IN ACTION.—F/O. R. T. Pentland.

MISSING, BELIEVED KILLED IN ACTION.—F/O. G. E. McTaggart.

MISSING.—Sgt. R. J. Baroni; Flt. Sgt. D. Bernard; P/O. K. L. Brager; P/O. T. D. Cockrane; W/O. A. N. Gott; W/O. M. A. McCurdy; Flt. Sgt. L. A. McQuestion; Sgt. J. E. Redmond; Sgt. E. Smith; P/O. J. A. Taylor.

KILLED ON ACTIVE SERVICE.—Sgt. L. D. Griese; Flt. Sgt. P. R. Humphrys; Sgt. K. N. Lake; Sgt. H. L. Miller.

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. A. E. Bruce.

Royal New Zealand Air Force

KILLED IN ACTION.—P/O. R. Crossgrove, D.F.M.; F/O. R. F. Jenkin, P/O. C J. Kinross; P/O. D. E. Simms.

WOUNDED OR INJURED IN ACTION.—P/O S. H. Moon.

MISSING.—Flt. Sgt. N. J. A. Helean; F/O. A. G. Metcalf; Flt. Sgt. A. B. Sheldan.

KILLED ON ACTIVE SERVICE.—F/O. W. H. C. Toombs.

DIED ON ACTIVE SERVICE.—P/O. W. E. B. Turner.

South African Air Force

KILLED IN ACTION.—Flt. Sgt. J Hamilton; Lt. L. W. Lovell-Wright; Lt. D. W. Luke; Lt. A. F. Staples.